MILITARY REVIEW

U.S. ARMY COMMAND AND GENERAL STAFF COLLEGE
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Military Review

MISSION.

The MILITARY REVIEW disseminates modern military thought and current Army doctrine concerning command and staff procedures of the division and higher echelons and provides a forum for articles which stimulate military thinking. Authors, civilian and military alike, are encouraged to submit articles which will assist in the fulfillment of this mission.

POLICY.

Unless otherwise indicated, the views expressed in the original articles in this magazine are those of the individual authors and not necessarily precisely those of the Department of the Army or the U. S. Army Command and General Staff College.

Editor.

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KEEPING PACE WITH THE FUTURE--

Fort Leavenworth Develops the *COMPLETE* Man

Major General Lionel C. McGarr, *USA*
Commandant, U. S. Army Command and General Staff College

***Honor is like an island, rugged and without shores; we can never reenter it once we are on the outside.*—Boileau**

This is the eleventh in a series of articles expanding various aspects of "USA Command and General Staff College Keeps Pace With the Future," written by Major General Lionel C. McGarr, USA, *Commandant of the College, and published in the April 1957 issue of the* MILITARY REVIEW. *—Editor.*

WITH the completion of the 1957-58 course and the preplanning for this year at the USA CGSC, I feel it appropriate that we reexamine the performance of our mission, as visualized in the initial article of the "Keeping Pace" series in the April 1957 *Military Review*. Our graduates must be prepared to fight and win on tomorrow's battlefields, in the grey zone of the cold war, and at the conference table. Therefore, the College mission must be regularly reassessed against the background of continuing world tensions, the accomplishments of major College activities,[1] and the inherent responsibility of Fort Leavenworth as it concerns both the tangible and intangible aspects of leadership as they affect command and staff instruction.

The grim, continuing struggle between opposing ideologies in this tension-laden, nuclear-missile era has been highlighted repeatedly by the use of varying types and degrees of force by our opponents. Lately they have employed the covert force of indirect subversion, as in the strategic Middle East, and the naked force of overt military suppression, as in Hungary. It is clear that these are but milestones, marking different kinds of aggression short of all-out war, in support of the often repeated Communist policy of world domination through world revolution. This is a pattern of ruthless employment of force for calculated objectives short of those for which our enemies believe we would risk all-out war.

In the Middle East, and in previous similar incidents, the tactic is a multi-pronged attack calculated to win, or influence, the minds of the uncommitted peoples of the world, and create doubt in the minds of our Free World friends and allies. This now familiar tactic contains variations such as Mr. Khrushchev's "letters," "identifying" communism as the champion of nationalism or other minority groups, divisive and obstructive legalistic action in the UN, sabre-rattling threats of "volunteers" and ICBM's, ostentatious military concentrations near the country marked for subversion, and, finally, direct or indirect subversion working within the country to be absorbed. This maneuvering is, of course, covered by strong, well-directed propaganda skillfully fixing in the minds of all concerned the "reasonableness" of Communist claims. At the same time, the fateful shadow of

[1] As outlined in the "Keeping Pace" series.

Imre Nagy and the Hungarian freedom fighters, by implication, remains a nightmare to smaller countries, warning them against challenging the desires of the Kremlin. This type action, designed to generate a fear complex based on the ruthless use of naked force, has all too often given communism the victory by default.

The West's losses so far are due, in part, to the psychological problems and the mental lethargy of our people in really understanding the force, skill, and unrelenting nature of the varying forms of Soviet aggression. Mr. Lodge's statement that the UN must cope successfully with indirect aggression if it is to survive, shows a strong, governmental awareness of this situation—an awareness which became clearly evident with the Greek crisis in 1947. The US role in the Middle East and elsewhere, as well as that of the remainder of the Free World acting through the UN, must be to stop and reverse the "chain reaction" of aggression, either indirect or direct, that serves the long-range objectives of international communism—or any other aggressor.

More and more it is becoming clear that our military planning must be geared towards rapid application of combat ready, balanced and tailored forces—a readiness for limited or cold war to include situations short of war—if we are to counter and overcome these threats to our national existence. This requires a higher degree of trained leadership at all levels than ever before.

There is no sense of complacency at the College, only a sense of vital urgency for continuing improvement. In this respect, the College has employed questionnaires to the field, student after action reports, and continuing critical staff study in evaluating the effectiveness of its instruction.

Major Accomplishments of the 1957-58 Reorientation and Rewrite

This continuing world pattern of aggression and tensions was one of the overriding motivations dictating the urgency of the reorientation and modernization of the curriculum undertaken two years ago by the USA CGSC—a modernization which made further progress possible and which, in regular Fort Leavenworth tradition, is now being capitalized upon by continuing modernization and improvements in the 1958-59 courses. Now as then, *urgent* improvement is the key if the Army as an eminent member of the tri-Service defense team is to perform its mission effectively as an instrument of national policy in this nuclear-missile age.

As the other 10 articles of the "Keeping Pace" series by major staff members and instructional department chiefs have detailed the College accomplishments in the 1957-58 course, I shall not go into detail here. However, in one year, the College effected a complete curriculum rewrite with required reorganization of the Staff, the Resident Instruction Departments, and the Combat Developments Department while also effecting improvement in the quality of instruction in the Department of Nuclear Weapons through a marked reduction in the complexity of instruction.

Of course, a job of this magnitude could only have been accomplished with the loyal, dedicated, imaginative support of the hardest working group of officers I know; the Staff and Faculty of the USA CGSC.

Among the principal "bonus" effects of completing this reorientation and rewrite in one year was the accomplishment of a balanced, flexible curriculum, bringing lagging nonresident instruction abreast of current resident instruction and ensuring that all pertinent instructional problems

employ likely locales, are "conditioned" basically by the nuclear threat, and employ realistic "level of use" of atomics. Highly important, the "forms of war" used in instruction were brought into line with Department of the Army and US CONARC thinking and directives, thus giving proper emphasis to limited war and situations short of war. In addition, this instruction was presented under a modernized instructional philosophy designed to prepare students as military problem solvers of the future by teaching them to think, decide, and operate instead of memorize, in the application of principles. Realizing that in the future, as in the past, America's wars will continue to be won in the classrooms of our military schools and colleges, Fort Leavenworth is teaching its students to fight with their heads as well as their hearts in the resilient employment of new concepts and newly evolving doctrine as flexible instruments of the art of war. Truly this requires mental mobility of the highest order!

There is one other important continuing facet of the College reorientation which deserves particular emphasis—the decision to strengthen and coordinate the College means for doctrinal development by centering it in the new office of the Assistant to the Assistant Commandant for Doctrine. This office ensures continuity and consistency, College-wide, in the *development* of current doctrine and new concepts, while at the same time monitoring and assisting the Department of Combat Developments in developing future doctrine. Doctrine is the heart and soul of *forward-looking* instruction as it is an element which, of necessity, employs the type of imaginative and creative thinking which lends itself to progress. This progressive development of doctrine is vitally important to over-all improvement. Doctrinal soundness and feasibility are absolute necessities if the College is to carry out its responsibility for assisting US CONARC in reviewing and coordinating doctrine of the branch schools pertaining to the doctrine of the Combined Arms and Services. Forward-looking doctrine is equally important in ensuring that the College takes a modernized approach to Combat Developments projects and other similar higher level requirements which fall within the College mission and which affect the entire Army.

In line with this emphasis on Doctrinal development, one of the most significant improvements in the College has resulted from increased emphasis on the development of modern *logistical* doctrine with consequent similar improvement in logistical instruction within the scope of the College mission. This was felt necessary to assist in bringing Army-wide logistical development abreast of operational development. As reorganized in 1957 for the 1958 school year, the College effort was focused on logistics through: a new

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Major General Lionel C. McGarr was graduated from the United States Military Academy in 1928 and subsequently served with the 25th, 24th, 21st, and 30th Infantry Regiments. He went to French Morocco with the 30th Infantry Regiment, 3d Division, in 1942 serving in combat there and in Italy. He became Commander of the 30th Infantry in 1943 in which capacity he served in Italy, France, and Germany. He was named Assistant Commander, 3d Infantry Division in Germany where he served until November 1945. He graduated from the National War College in 1947 and was assigned to the Intelligence Division of the Army General Staff that year. He commanded the 350th Infantry Regiment in Austria, was Tactical Inspector o' US Forces in Austria, and in 1951 was named Chief of Staff of the Tactical Command of these forces. In July 1952 General McGarr went to Korea as Assistant Commander of the 2d Infantry Division, later becoming Commanding General of the United Nations Prisoner of War Command. He assumed command of the 7th Infantry Division in Korea in October 1953. In 1954 he was designated CG USARCARIB in the Canal Zone. He assumed command of the U. S. Army Command and General Staff College in July 1956.

instructional department of administrative (logistics) support, a new staff department, both specific and integrated instruction in the new division departments, and improved control and coordination at both the College staff and department levels. In addition, a strong logistical section has been established in the reorganized Department of Combat Developments.

Tangibles

It is important that we keep in mind that the adjustments of last year's curriculum mentioned above have been concerned mainly with the well-understood tangibles of Command and Staff Instruction which lend themselves to more or less accurate mathematical type evaluation and measurement. Of equal or even greater importance are the intangibles of the reorientation which affect the curriculum, the educational philosophy, and, through them, the caliber of the graduate. These intangibles will be examined after a brief glance at the more tangible elements of command.

It is important that the growing military threat which compels the diversion of much of our highest thinking and skills to the production of weapons of mass destruction, must not cause a reduction of the individual, professional, and national moral values on the part of those required to man these weapons. War is not merely a science of inanimate patterns of mechanical, chemical, and nuclear forces and energies, but also of human beings and their reactions under varying conditions.

Secretary of the Army Brucker has so truly said:

Today's officer must have the mental flexibility, the imagination, to utilize to the fullest extent the developments of modern technology. Nevertheless, he must not lose his soldier's soul in the laboratory. Above all he must have the integrity and character of a Washington, the moral convictions of a Lincoln, and the tenacity and fighting ability of an Eisenhower, a MacArthur, and a Patton. These are high standards, but they are the standards of our present dedicated leadership, and will always be the hallmarks of the great officer.

Down through the ages, volumes have been written on leadership. Significantly, the writer usually emphasizes physical leadership primarily, and either starts or finishes by talking about himself. He does this because leadership, in this sense, as an element of command is actually a very personal and tangible quality. It has been well-defined as a mixture of example, persuasion, and compulsion. Leadership can truly be stated as an *extension* of the leader's self—his personality and *character.* Obviously this extension can go no further than his own qualities in this respect, whether they be physical, psychological, or moral.

Of the many qualities desirable to a high degree in any leader, I would say that integrity, judgment, willpower, flexibility, stamina, and knowledge are absolute essentials. Still, these alone are not necessarily enough to earn the respect and confidence of the troops. The additional qualities of honesty, humility, and self-sacrifice added to the above have invariably been present in the great captains of history. These are the Captains who have stood on a stricken field and won by the fighting fury of their troops, in spite of insurmountable odds, because they had extended or projected their own unconquerable personality into their men. Commanders of history are legion, but leaders such as these can be counted on the fingers of one hand—and these leaders of moral

courage have, significantly, all had physical courage as well! *This is because the only motivations which are capable of sustaining men under great stress and responsibility are those of a spiritual or moral nature.* It is the leader of moral courage who is able to distinguish between willful obstinacy and strength of will. His development having been well-rounded and his decisions based thereon complete, he has been able to keep a flexible mind with regard to the *fine balance* necessary between willpower and willfulness. In this respect, men of moral courage have regularly shown a strong, *healthy* bias, but they have never been prejudiced in their approach. For this reason, these leaders were successful in moulding the minds and hearts of their men towards their own desired goals.

Intangibles

One of the major objectives of the College reorientation was an **intangible:** *Character Development and the building of sound Professional and Ethical values.* This quality, although difficult of precise measurement, has always been and will always be an all-important hallmark of the successful leader. The purpose of this element was to require the students to consider ethical implications in decisions involving moral courage and the development of a sound over-all sense of values. Although the Army has kept pace operationally and to a considerable extent morale-wise with the conditions forced by flexible and versatile weapons systems and fast-moving technology, the College feels it has not kept pace proportionately in a realization of the importance of the intangible moral factors that improve combat effectiveness. These are too often taken for granted.

All the Services have traditionally emphasized leadership, both physical and moral, in their regulations, policies, and customs of the Service. In this respect, Army Regulations 15-120, May 1955, shows that the Department of the Army Character Guidance Council was established in August 1948. This AR states that the Character Guidance Program was "designed to encourage the individual to develop moral responsibility and self-discipline." Although the commander's responsibility is made clear therein, the advisers mentioned and the scope of the training directive paragraph indicates that this is beamed mainly at the enlisted man and junior officer level. Department of the Army Pamphlet 600-2, 1956, republished from the excellent Department of Defense book, *The Armed Forces Officer*, also emphasizes the moral side of command. However, *Officers' Call*, which is definitely beamed at the officer level, indicates considerable room for improvement by stating, "An individual may be thoroughly honest and dependable and still be lacking in the deeper integrity required of an officer." The College is convinced that the Army, if it is to fulfill its full duty to itself and to its country, needs to modernize old concepts as well as to re-emphasize and revitalize moral leadership by the maintenance and teaching of moral standards—particularly by the strong personal example of those in authority at all levels of command.

The College fully realizes that the Army selection system for students attending the USA CGSC ensures exceptionally high personal standards and it certainly has no intention of setting itself up as a fountainhead of Army morality. It is also realized that this continuing development of professional standards and quality of the students and Faculty will be mainly one of degree. However, the fact that officers have demonstrated these traits in their past *levels* of service is not, of itself, assurance that they all possess these traits to the extent required for successful, demanding, *higher* level leadership without further continuing refinement. The College believes these necessary traits can

be further developed and refined to a useful degree by study, example, classroom practice, and association with fellow students of high moral caliber in the atmosphere of an intensive and traditionally demanding academic course. Just as it is normal and realistic to integrate the all-important *psychological* aspects of command into decision making, it is also normal and realistic to integrate the *moral and ethical* aspects into the tactical and administrative judgment and decision-making instructional problems.

In fact, instruction which does not contain these inherent aspects of staff advice and decision making is not fully realistic and does not fully develop the student's capacity for responsible and effective decisions. Nor does it give him the proper moral basis for his optimum use in battle of his most precious commodity—MAN. Of course, the College has accomplished this integration into its instruction without either diversion of instructional hours or "moralizing" in its curriculum. As a development of progressively higher ethical standards of character traits in subordinates is obviously the responsibility of all commanders to include service school commandants, the College has accepted the definite military responsibility to assist in the continuing reinforcement of the professional standards, ethics, quality, and integrity of the Officer Corps through the education of its graduates.

Although it may be felt by many that little can be done to modify their own present integrity, nothing could be farther from the truth. Actually, integrity, moral courage, and ethics are like health —they are not *absolute* terms. They vary *within* individuals and also with the passage of time. All officers are not *born* with integrity and no man can *give* them this quality. It is something that they themselves, with proper guidance, must create, maintain, and constantly improve by their own moral habits throughout their lives. Moreover, integrity, like everything else in life, is not static. You either go forward or you go backward! Every time an officer correctly makes and follows a difficult or demanding moral decision, he increases his future capacity in this regard. Every time he faces up to a hard decision and meets it squarely and honestly, he contributes to the greater development of his own innate integrity —thus contributing to the quality of his decisions. On the other hand, every time he accepts less than the highest standard of conduct, he creates a habit pattern—no matter how small—which correspondingly weakens and compromises his capability to resist future temptations of the same nature—thus detracting from the quality of his decisions. This strengthening of the moral side of the leader increases his ability and determination to accept his responsibility of doing his full duty on the atomic battlefield.

High among leadership prerequisites are traits of motivation and character, as well as those other qualities, which constitute the *moral side* of the leader. These qualities become of increasing importance in either command or staff positions as an officer *advances* in rank and responsibility. Particularly important to sound higher level leadership is a highly developed sense of ethical values coupled with the balance, sense of duty, and moral courage to apply them. The higher level leader must demonstrate integrity, courage, resourcefulness, and stamina in complex, critical, decision-making situations, both in peace and in war. He must exhibit personal morality and obligation to his men and society. Even more important, he must also possess a lasting capacity for examining, amending, and refining the ethical and moral criteria he habitually employs. "I would emphasize," said President Eisenhower, "the need for developing yourselves

as effective leaders in the moral and spiritual realm of life."[2]

There are two aspects of character development in a service school or college: the "passive" one of preventing deterioration of personal standards, both within and without the classrooms, and the "positive" one of reinforcing and strengthening the desired qualities in the student through specific curriculum emphasis appropriate to the level of instruction. Both require *recognition* of the responsibility by the school concerned and a *definite program* for improvement.

The possibilities and results of the use of nuclear weapons will be far-reaching and fraught with tactical, psychological, and moral consequences at all levels far beyond anything encountered in the past.

Traditionally, the Post environment of the student at Fort Leavenworth has been outstanding. It reflects the high quality of Post personnel, student officers, and Staff and Faculty assigned and contains fine religious, social, recreational, and civic programs established over the years. Likewise, the classroom environment also has been sound. However, as always, this was capable of being improved upon for the recently completed 1957-58 course. This was particularly so in the area of reposing *greater* trust and confidence in the students, more *clearly* delineating the ethical standards the College expects from the student, and *developing* the student's sense of responsibility towards the group and towards each other.

As mentioned previously, the College has a military responsibility and is in a key position to assist in the continuing development of the professional standards and quality of the Officer Corps. Its graduates form the hard core middle leadership of the Army which in a few years will become its top leadership. In addition, the College is convinced that these qualities of moral strength, as they impact on personal leadership, will be needed in an *increasing* degree on future cold or hot war battlefields. More than ever, the future depends on the *moral* stature and courageous leadership of *those* exercising great authority, for moral courage, as it applies to our military code of ethics, is like faith in God. It must be nurtured and used, lest in our hour of trial it not be there. It is interesting and comforting to note that a census after World War II showed that 60 percent of returned men said they had been *morally strengthened* by their military service in American uniform.

In summary: the United States Army Command and General Staff College remains dedicated to its mission without complacency or compromise of standards, of making its full contribution to the education of the Officer Corps and the development of forward-looking combined arms and services doctrine for the Army in the field. During the 1958-59 academic year, it continues its role of teaching both the tangible and the intangible facets of leadership and command as they apply to the College mission of producing military problem-solvers who can think objectively, decide logically, operate successfully (and not merely "memorize") in the flexible application of the all-important principles. This requires the *full* development of the physical, mental, psychological, and moral aspects of the student officer. Emphasis is being given the moral side by the *integrated* development of the standards of integrity and professional ethics which the College is convinced will be needed to an increasing degree on future battlefields

[2] Commencement address, United States Naval Academy, 4 June 1958.

conditioned by atomics. Surely we cannot afford to be more concerned about building accuracy, reliability, and integrity into our new weapons systems than about developing and strengthening similar required qualities in our leaders who will have the authority and responsibility for employing these weapons systems.

In maintaining its standards in this important area, the College has initiated a positive program of creating a healthy classroom environment of trust and confidence while requiring that tactical decisions be based, where applicable, on the application of moral courage and integrity in deciding the "harder right from the easier wrong."

USA CGSC feels that the greatest battle of our times is for the mind, the heart, and the soul of man. The College is convinced that its military contribution must be towards a better way to use man, the *constant* in the "equation of battlefield success." This, of course, requires the continuing development of the *moral* as well as the physical and mental side of the student—the development of the complete MAN.

God grant that men of principle shall be our principal men.

Thomas Jefferson

THE CHAIN OF DEFENSE

Major Reginald Hargreaves, *British Army, Retired*

A chain, it is said, is no stronger than its weakest link. In the chain of defense positioned to hold back the outward thrust of Communist-imperialism from its Sino-Russian "heartland," there are many links whose degree of strength leaves a good deal to be desired. Admittedly, "to attempt to defend all is to defend nothing." But if the weak points in a levee are known and registered in their appropriate category, it is far easier to bolster them, should the time come for them to be subjected to maximum pressure.

In the Far East it is a virtual certainty that an all-out Communist drive in Korea would necessitate the evacuation of such of the United Nations and Republic of Korea contingents as could be extricated. They garrison an advance post in close proximity to an enemy force easily strengthened from nearby bases; to halt which would commit the West to a major campaign in a minor theater.

In the same way, in any global war the small garrisons of Hong Kong and Singapore would be forced to withdraw at the sacrifice of a devoted rear guard. They are, all three, in the position of outlying pickets, that must expect to be driven in.

Japan and Taiwan, on the other hand, facing the land mass of Communist China, would demand immensely powerful amphibian expeditions, with exceptionally strong air cover, seriously to threaten their defenses. Both would have the very considerable support of the sea, land, and air forces concentrated in the bastion of Okinawa; whence at least 3,500 aerial missions could be dispatched *per diem.*

Midway, Wake, and Guam, vital links in the chain of defense, are safely in American keeping. But it is idle to pretend that the United States politically generous but militarily premature relinquishment of responsibility for safeguarding the Philippines has strengthened the system of defense designed to hold Communist aggression in check. Moreover, all these strongholds in the Pacific are dependent upon their sea communications for survival. With Hong Kong and Singapore in hostile hands, enemy submarines would have two additional and extremely useful bases from which to sally forth and prey upon their opponent's lifelines. Conditions would be appreciably worsened were the Indonesian crypto-Communists permitted to carry out their threat to seize Dutch West Guinea. This inevitably would lead to the installment of an inimical regime obliquely to the rear of the Midway-Wake-Guam-Luzon *cordon sanitaire,* further imperiling activities in the Pacific and virtually completing the isolation of Australia.

Indian Ocean

It may be taken as axiomatic that the Western Powers would exert every endeavor to prevent the Communists from gaining supremacy in the Indian Ocean. Difficult as the task might prove, it would

Although parity in the matter of the nuclear deterrent is essential as a "background" in any conflict with communistic forces, we still must rely upon man, wielding superior firepower, to ensure our victory

be absolutely essential to deny these waters to the enemy. Should Egypt bar transit through the Suez Canal, and should the Indian Ocean become a Communist lake, the outflow of oil from the Persian Gulf would be reduced to such minor quantities as could be transported through the Mediterranean from depots in the Levant. And these, like the overland pipelines, would be at the mercy of the Communist *point d'appui* in Syria.

The successful Japanese penetration of the Indian Ocean in World War II demonstrated the ease with which this area can be dominated by a resolute hostile force based on Singapore, even with the facilities of Colombo at the disposal of the Western Powers. These facilities are no longer theirs. Indeed, with Singapore in enemy hands and with Communist forces following the path blazed by the Japanese, there would be no base from which to operate between a precariously poised Aden and the Philippines, except for the microscopic island of Gan, in the Maldives. That is part of the price that has to be paid for the well-intentioned but disastrously mistimed anticolonial campaign; for the intractable problems of today invariably are found to be the children of yesterday's shortsighted policy.

In the struggle against the Axis partners, the Japanese finally were ejected from the Indian Ocean and overthrown in Burma by virtue of the fact that India herself could be utilized as a base for operations. With Pandit Nehru's completely unreal but persistently protested "neutralism," there can be little doubt that in the event of global conflict between world communism and its opponents, India would endeavor, however unsuccessfully, to stand aside. In any case it would be some time before events forced her to adopt a positive attitude. Continued denial of the use of her territory to the Western Powers would, however, ensure her eclipse by the Sino-Russian forces that encompass her on every hand.

Communist China

On the east, Mao Tse-tung's task would be considerably easier than that which confronted the Japanese in 1942. Communism already reigns triumphant in Vietminh. Vietnam, Laos, Annam, and Cambodia—all forming part of the Chinese Outer Empire in dynastic days—are objects of the Red threat. In Malaya, Chin Peng only awaits the word from Peiping to reactivate his very considerable force of jungle fighters and their innumerable sympathizers. Nearly half the population of Malaya is Chinese; and the Communist Chinese Constitution regards all overseas Chinese as Chinese nationals. The Malayan Chinese also would come under this heading. Thailand is threatened with Communist aims. In Burma, U Nu is presiding over a state in which the government has had difficulty suppressing the Communist insurgents of the Upper Chindwin, led by Thakin Than Tun.

Tibet is under open Communist control with new strategic roads traversing the difficult terrain, both toward the Indian frontier and back into Red China, while the inevitable centers of propaganda and clandestine disruption have been established well within Indian territory.

To the west, Russo-Chinese forces would have the choice of three lines of advance. First, with a forward base at Krasnovodsk, they could move straight through Balkh to climb the Hindu Kush, and push on through Kabul to Peshawar by way of the Khyber

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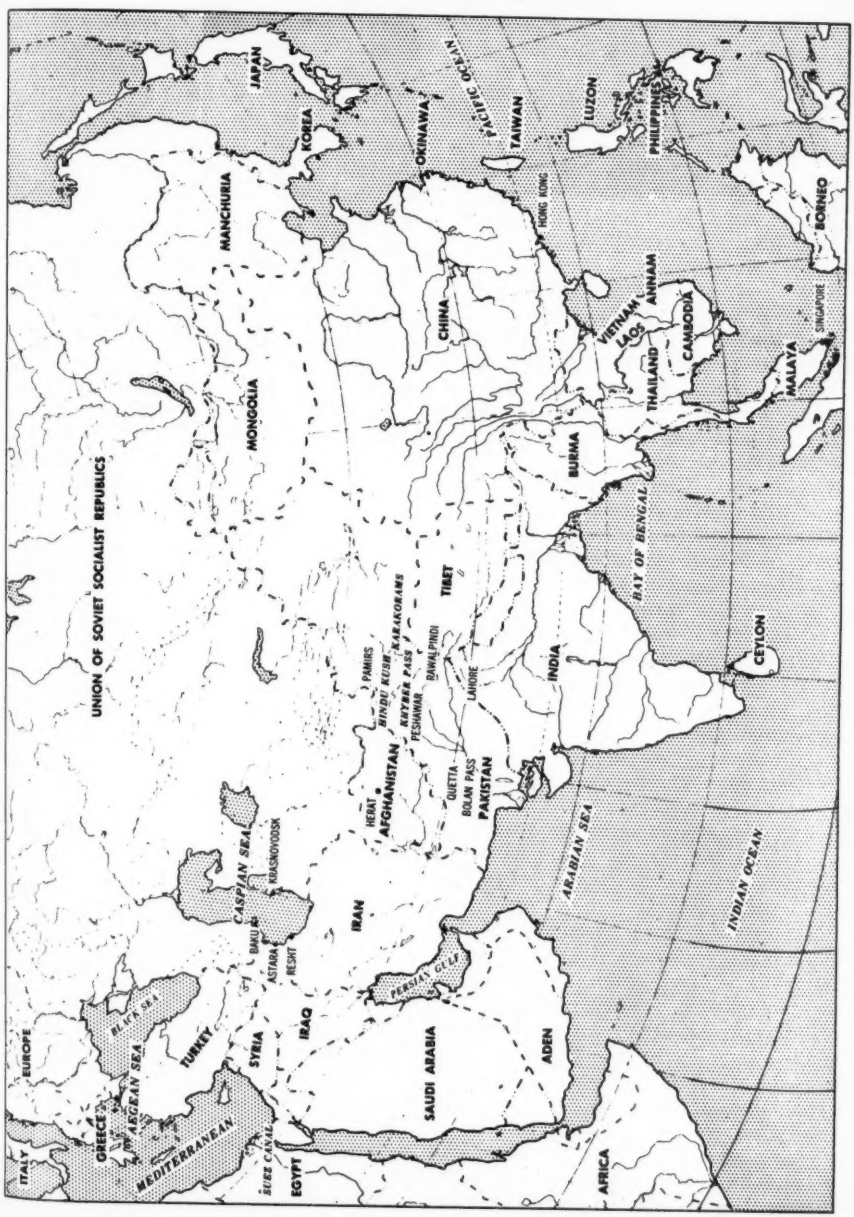
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Pass; the traditional route of conquest followed in turn by Alexander the Great, Mahmud of Ghazni, Genghis Khan, Timur, Baber, and Nadir Shah. Second, they could swing right and, following the borderline between Persia and Afghanistan, strike through the Bolan Pass, below Quetta. Third, there is the difficult but not impossible route across the massif and passes of the Pamirs and Karakorams.

India

Against any of these lines of advance India could, of course, be successfully defended, given the necessary troops and *matériel*—and the sustained will to resist. The Hindu Kush offers innumerable vantage points to a holding force, and could be more speedily reached by troops based on Peshawar, Lahore, and Rawalpindi than by the forces of invasion whose lines of communication would be far longer and more precarious than those operated by the defense.

If the assault came by way of the deserts of Iran (Persia) and Southern Afghanistan, the Bolan Pass and its subsidiary reentrants offer equally good defensive positions, with short lines of communication as against a thousand mile enemy supply route across a virtually trackless waste wherein the water problem would always be acute. Equally, if invasion were attempted across the Pamirs, it could be forestalled in the passes, with similar considerations with regard to the lines of communication.

But *laterally* India's communication system leaves a very great deal to be desired. Were the military authorities wrong in their diagnosis as to which constituted the real thrust, and deployed the main body of their troops to meet a mere diversion, it would prove extraordinarily difficult to switch them to the principal theater of operations.

In the event of a global conflict into which India was dragged willy-nilly, an additional drain on her meager military resources inevitably would be imposed by the need to isolate and subdue the avowedly Communist State of Kerala—the erstwhile Travancore-Cochin. Situated on the western face of the Cape Comorin Peninsula, looking out over the Arabian Sea, and with a population of 13,600,000, Kerala is a veritable Trojan horse in India's midst.

In short, in the event of global conflict India would find herself in the hapless position of a carp in a pond full of pike. If forced by the pressure of events to take up arms, it is questionable if her prickly national pride would permit her to call on the West for military aid in good time; and even more open to doubt if her army could hope to deal with insurrection in Kerala *and* hold the northwest frontier until such time as outside help had been besought and was actually forthcoming.

Northern Tier

With the Bay of Bengal and all its hinterland in hostile hands, a possibility that cannot be ruled out, Pakistan—the sixth power and a solid element on the right flank of the "Northern Tier" alliance of Britain, Turkey, Iraq, Iran, and, more doubtfully, Afghanistan—would be dangerously "out on a limb" and with no naval aid within anything like helpful proximity. The Arabian Sea, like the Indian Ocean, would be turned into a maritime arena from which the expulsion of Sino-Russian forces would demand very considerable exertions.

Although the buffer State of Afghanistan is a signatory of the Baghdad Pact, or "Northern Tier" association, it is fearful of its Communist neighbors to the extent that it will not permit travelers—even if citizens of the land itself—to go anywhere near the river Oxus which forms the country's frontier. Herat, the only town of considerable size in the vicinity of the line of demarkation, is 35 miles from the banks of the stream. Afghanistan could put up only slight resistance to anything like a

major invading force, although its hardy, straight-shooting tribesmen, like those of Baluchistan, would form a ferociously effective guerrilla element to plague an invading army's lines of communication.

The Iranian frontier with Russia is longer even than that of Turkey, and far less favored with naturally defensible terrain. The stretch of borderland between the lower end of the Caspian Sea and the Turkish boundary potentially is the most vulnerable link in the chain of defense, and has, therefore, been fortified more strongly than any other point of contact. A system of field works, well-entrenched, lavishly wired, and constantly patrolled, suggests nothing so much as a large-scale version of the famous Hindenburg Line of World War I.

No goods or travelers are allowed to cross the border which is not so much a frontier as a frontline. The Iranian outposts are based on the township of Astara, on the river of that name, which runs into the southwest extremity of the Caspian. The other half of the town is on Russian territory and entirely unapproachable. It is true that a wooden bridge, 20 yards long, spans the stream. But in the middle of it stands a barrier 12 feet high, and anyone approaching within 20 yards on the Iranian side of the bridge risks a rifle shot from the Russian guardhouse.

Rich Prize

Five Soviet divisions are concentrated opposite this northwestern border of Iran, and a 1,000-ton gunboat is based on the haven of Russian Astara, beyond the bridge. Obviously, Astara would serve as the most suitable bridgehead for any Soviet landing on the southern shore of the Caspian, and the incitements to invasion by this route are particularly compelling. Ahead would lie the fabulously productive Iranian oil wells, and those equally fruitful installations of the Persian Gulf upon which Western Europe is almost entirely dependent. Furthermore, invasion by this line of approach would outflank the far less assailable prepared positions installed along Turkey's rugged, mountainous borderlands.

During World War II rail communications from the seaboard to the frontier were greatly improved for the purpose of pouring in British and American *matériel* to help the Russians maintain their fighting front. And the railway runs *to* the coast as well as from it!

Moreover, owing to the exigencies of war, the Russians were permitted to occupy the Iranian border province of Azerbaijan. Their propaganda and indoctrination departments worked to the fullest possible pressure throughout their entire stay, while a swarm of agents was left behind with their withdrawal. In the outcome it is computed that Communist sympathizers in this vital area number well over three million—deluded dupes who are held firmly to their acquired allegiance by the horde of emissaries remaining when the Russians finally took their departure.

In addition, the wild tribes of the Iranian mountain lands might prove themselves as accessible to Communist agents as they were to the clandestine representatives of the Nazi government throughout World War I.

Turkey

The Turkish Army, admirably equipped with the aid of American subsidies and *matériel*, in a short time could be expanded to the strength of one million effectives. And they would be tough, resolute fighting men, as all those who have served with or against the Turk would readily be prepared to testify. With their age-old and well-founded distrust of the Russians, their border forces maintain a ceaseless and vigilant watch on the frontier and on much that transpires beyond it.

Turkey's dread is not so much that a direct assault could not be halted, as that her entire defensive organization could be

outflanked. The Syrian back door rather than the country's front gate constitutes the weakest link in Turkey's chain of defense. This also could be assailed from the right flank and rear should the line fail to hold between Astara and the point west of Mount Ararat where the Iranian frontier links up with its neighbor's.

Outflanking Moves

The menace of Russia's acquisition of a well-placed satellite in Egypto-Syria scarcely can be exaggerated. It should never be forgotten that the Kremlin's original and much cherished plan for the wholesale conquest of Europe—worked out before the last shot had been fired in the war against the Nazis—was designed to outflank the West by absorbing Greece or Turkey. Obviously, neither country could hopefully defend itself were the other in Red Air Force hands. Greece was to be overwhelmed first, since she is extremely vulnerable on her northern borders, where a successful drive through Yugoslavia and the beckoning Monastir Gap would lead very speedily to the reduction of the port of Salonika, and to access, by way of the Aegean, to the waters of the Mediterranean.

Far from receding, the threat to Greece and Turkey has increased, for both are assailable from Syria as well as from Bulgaria. With Soviet bases established in either—or both—Italy's fall would be facilitated and the isolation of the Iberian Peninsula would present few difficulties. The way thus would be left open to penetrate to the heart of Europe where a double envelopment could be brought about by Russian forces from the southwest moving to join hands with complementary Red Army units moving on the Rhine from East Germany and Czechoslovakia.

With Syria as a jumping-off place, the feasibility of the Kremlin's design would be enhanced greatly were simultaneous assaults to be launched from Bulgaria against Turkish Macedonia, and from Baku against the Iranian defense system between (Persian) Astara and Resht—the most sensitive area under the Baghdad Pact signatories' guardianship.

Sino-Russian Strength

Offensives on this vast scale would, of course, involve the employment of a tremendous number of troops. On this score, however, neither Moscow nor Peiping need entertain the least uneasiness. With the satellites to draw upon as well as the indigenous Russian peoples, the men in the Kremlin control populations that aggregate over 300 million. At short call, Marshal Malinovsky can put 400 divisions in the field; while the satellites are good for another 100. If the dependability, as front-line fighters, of these last-named is comprehensibly open to question, their employment on the lines of communication, under the eye of heavily armed *NKVD* (Soviet Secret Police), at least would serve to release more reliable formations for operational employment. Over the years trained reserves have been piling up at the rate of 800,000 *per annum*.

China's unnumbered population certainly is not less than 400 million; and at any time there would be more men available for armed service than Russia and China between them could conveniently contrive to keep equipped and supplied with munitions and the necessary support arms.

In effect, in sheer manpower the Sino-Russian *bloc* possesses a numerical superiority over the Western Powers they can never hope to overtake.

Western Strength

In a military sense the answer to numerical preponderance is outstanding superiority of firepower. That the Western Powers, with their greater technological and manufacturing resources, are in a position to ensure.

But superiority of firepower demands a very extensive armory which in turn calls

for a very considerable deployment of manpower for its operation.

It is, therefore, seriously open to question whether the West, in its avowed reliance on the nuclear deterrent, is not over-insured in "atomic" weapons, at the expense of those "conventional" weapons *and the "conventional" troops to exploit them,* by which the most probable form of conflict would be fought.

The Sino-Russian *bloc* has no desire to conquer a world in ashes. Its aim is the acquisition of the world as a going concern. This is an objective which automatically excludes the use of nuclear-fission weapons except as a last resort, to avert threatened defeat, or as a gesture of vengeful despair such as prompted Samson to immolate himself by bringing the pillars of the temple crashing down upon his own head.

All in all, the conclusion is inescapable that while parity in the matter of the nuclear deterrent is essential as a "background" in any conflict with the forces of Communist-imperialism, it is upon *men,* wielding superior firepower, that we must rely to ensure that victory is ours.

Conclusion

Currently, the most urgent task confronting NATO (North Atlantic Treaty Organization), SEATO (Southeast Asia Treaty Organization), and the "Northern Tier" coalition is to find a common strategy that makes sense to all their respective members, lest the interlocking organizations break up in an anarchy of independent "nuclear" and "nonnuclear" powers.

In formulating that dynamic, compulsive, and fully integrated strategy, it should always be borne in mind that now, as ever, *l'homme est l'instrument premier du combat.*

The aggregate strength of indigenous and US Army forces in vital strategic areas such as Western Europe must be sufficient to provide a strong forward shield, capable of repelling an attack by Communist armies. Trip wire or token ground forces will not suffice. Significant ground forces are needed to prevent a forward surge of hostile land forces seeking safety from our atomic weapons by a quick intermingling with our defensive units. In addition, they must be strong enough to gain for us the reaction time necessary to deliver retaliatory blows. Nuclear weapons in themselves cannot replace these ground forces. These weapons can, however, strengthen the ground forces through their improved firepower and thereby contribute to the ground deterrent.

General Maxwell D. Taylor

Atomic Planning for Rear Areas

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NUCLEAR weapons provide the commander with the most powerful destructive force yet known to influence operations. This is a statement that has been made many times when considering nuclear weapons and their impact on the tactical mission. If we accept this statement as being applicable to our own use of nuclear weapons, then conversely it applies equally well to an enemy possessing a nuclear capability. What, then, are the implications and complications brought about by the advent of the atomic age when considering rear areas wherein are located the great bulk of administrative support installations?

The major logistical installations of World War II would have presented many lucrative targets for nuclear attack. Such attacks would have so slowed logistical support as to have forced a halt of United States offensives, and if the attacks were sustained could conceivably have caused defeat. Current doctrine stresses increased dispersion between installations, reduced levels of supplies, increased velocity of the flow of supplies, and location of installations farther to the rear. However, nuclear weapon capabilities now greatly exceed those of World War II. The range of delivery means and the destructive power of nuclear weapons are increasing constantly; no important rear area will be entirely free from the threat of nuclear weapon attack. Further, if the supply of nuclear weapons is plentiful to an enemy, the number of targets in the rear areas considered profitable for nuclear weapon attack may be increased considerably.

In order to provide the administrative support required on an atomic battlefield successfully, a *calculated* risk must be taken in the atomic planning for rear areas. Attaining proper dispersion between—and location of—installations involves many considerations but can be done rapidly and easily by commanders and their staffs. One of the first questions to arise is, "What is the optimum dispersion between installations?" *There is no rule of thumb to apply.* Distance between installations must be established by consideration of the following factors:

1. The yield and number of nuclear weapons, and type of attack (air or surface burst) that the enemy is capable of delivering.
2. The nature of the terrain (to include manmade facilities such as mines, caves, and tunnels).
3. Limitations imposed by the availability of service units and local civilian labor.
4. The acceptable degree of inefficiency resulting from dispersion.
5. The losses the commander is willing to accept.
6. The availability and capability of transportation and communications means.

Factors like the principles of war often conflict. After having considered these factors, one can arrive at an acceptable compromise for the dispersion of installa-

The threat of nuclear warfare requires that commanders and their staffs devise a logistical system which will be capable of continuing the essential support of combat forces in event of nuclear attack

tions. Further, it is logical to assume that the enemy will employ his nuclear weapons only against the most profitable targets. Therefore, plans for the location of installations must consider making these installations less profitable or at least no more profitable than other targets within the same area. Intelligence establishes a basis for determining the types of logistical concentrations which the enemy may consider to be profitable targets.

Profitable Targets

The next logical question to arise is, "What are profitable targets?" Some examples follow:

1. Those installations most important to tactical operations, for example, class III and class V depots.

2. Those installations containing critically needed equipment or supplies, such as signal or electronic equipment or supplies, which require a long time to replace.

3. Those installations having a high or unusual level of supplies, for example, a quartermaster class II and IV depot containing the entire supply of winter clothing for a field army.

In order that these installations do not present profitable targets to the enemy they must be dispersed *and* duplicated. Duplication of depots does not mean necessarily an increase in the *total* tonnage handled—although the several depots may stock different days of level—only the administrative task of having two separate installations instead of one. However, depots must be far enough apart to prevent more than one installation *of the same type* being destroyed by a single nuclear weapon.

Damage and Casualty Radii [1]
(Distance in yards from ground zero)

Weapons	*Type of burst*	*Supply and maintenance areas* [2]	*Troops in forests, not dug in, and troops in cities*	*Troops in the open: Flash burns on exposed skin*	*Troops in the open: Other than burns on exposed skin*
One-Megaton	Surface	2,200	6,125	8,400	3,750
Five-Megaton	Surface	3,750	10,400	14,200	6,250

[1] Casualty radii are for delayed casualties and lightly injured personnel.
[2] Ruptured packages and/or contents damaged.

Figure 1.

Other Factors

In addition to dispersion and duplication, other very important but purely logistical factors must be considered when planning the locations of installations. For example, class III depots are located on pipelines, if available, or on railroads. Engineer and ordnance class II and IV depots receive large tonnages of wheeled and tracked vehicles and other bulky items. Thus it is desirable to locate at least one of these type depots on a railroad, thereby reducing considerably the requirement for tank retrievers and sim-

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ilar equipment for short-haul purposes within the field army service area. Ordnance class V depots should be placed on railroads. Finally, the locations of depots should be balanced, that is, similar depots should be located laterally to provide symmetrical support to the combat forces and which such dispersion will make the operation of the installation difficult and inefficient as well as increase the problem of local security. Depots properly laid out —internal storage areas containing dispersed, balanced stocks—are difficult to destroy completely by nuclear weapon at-

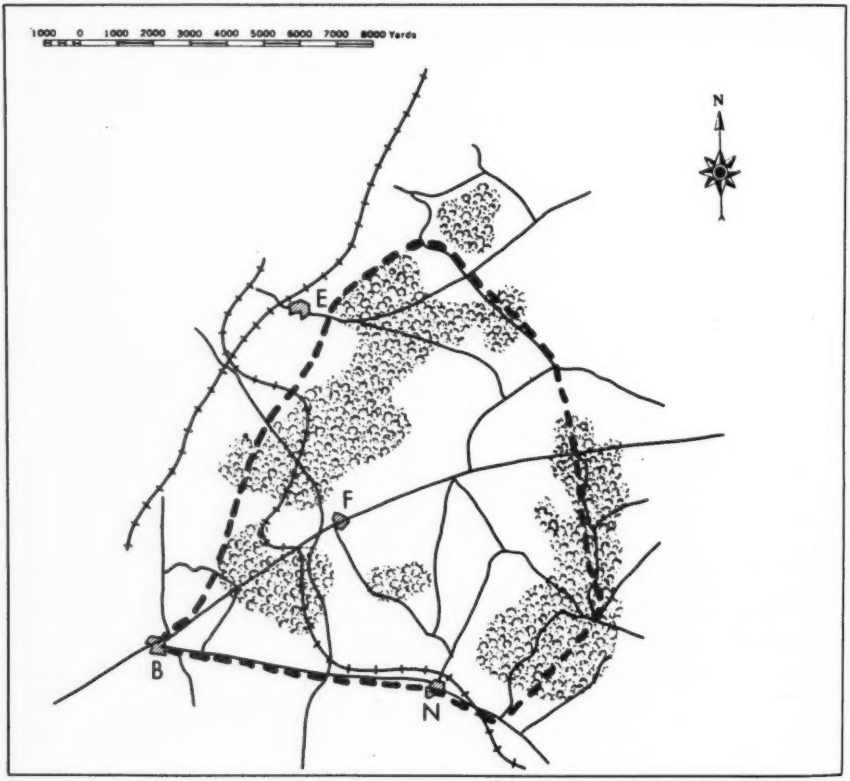


Figure 2.

yet so that both cannot be knocked out by the same weapon.

Dispersion within depots should be accomplished insofar as the terrain, and the road and railroad net permit. Generally it is not feasible to increase dispersion within depots beyond the limits outside

tack. However, they may be rendered ineffective to such a degree as to halt temporarily all operations except for salvage.

Weapons Familiarity

Familiarity with the concept and distribution of damage resulting from a

nuclear burst is necessary in order to analyze the vulnerability of our own installations to enemy nuclear attack.

1. Initial nuclear weapons effects are evidenced circularly on the ground around ground zero.

2. The severity of effects and, consequently, the damage from a nuclear explosion decreases with increasing distance from ground zero.

3. At any given distance from ground zero, there is an associated probability that a target element at that distance will be damaged. Close to ground zero there is a zone of certain damage where the probability of damage is very high, approaching 100 percent. The probability of damage decreases as the distance from ground zero increases, approaching zero percent, beyond which is the zone of no damage.

4. A radius of damage (R_D)—or more simply, damage radius—is the horizontal distance *at which* there is a 50 percent probability that a target element *at that distance* will be damaged to the level specified (severe or moderate). Expressed differently, 50 percent of all target elements

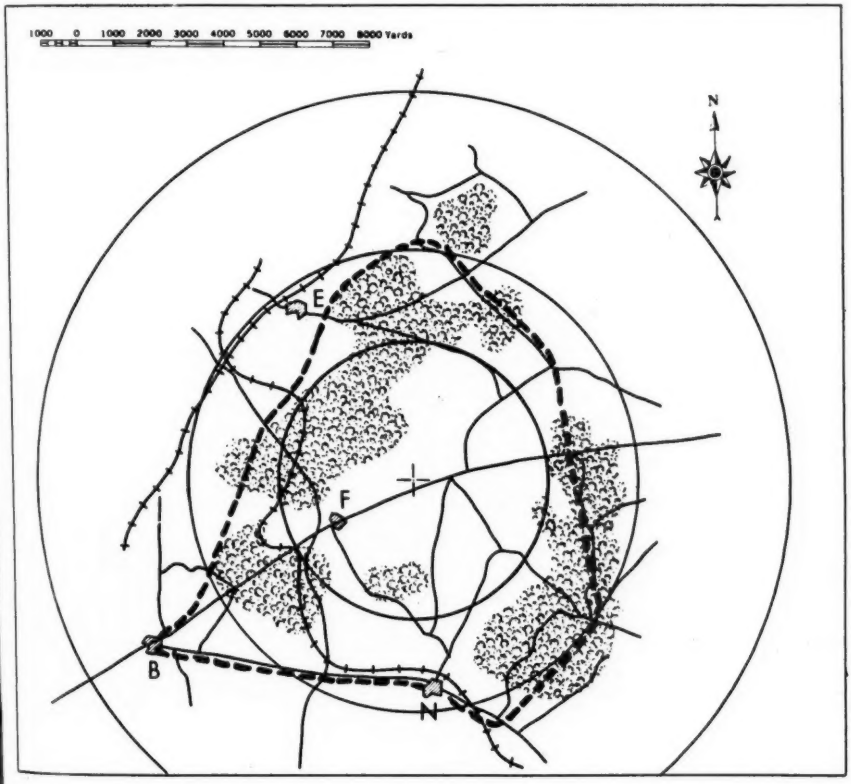


Figure 3.

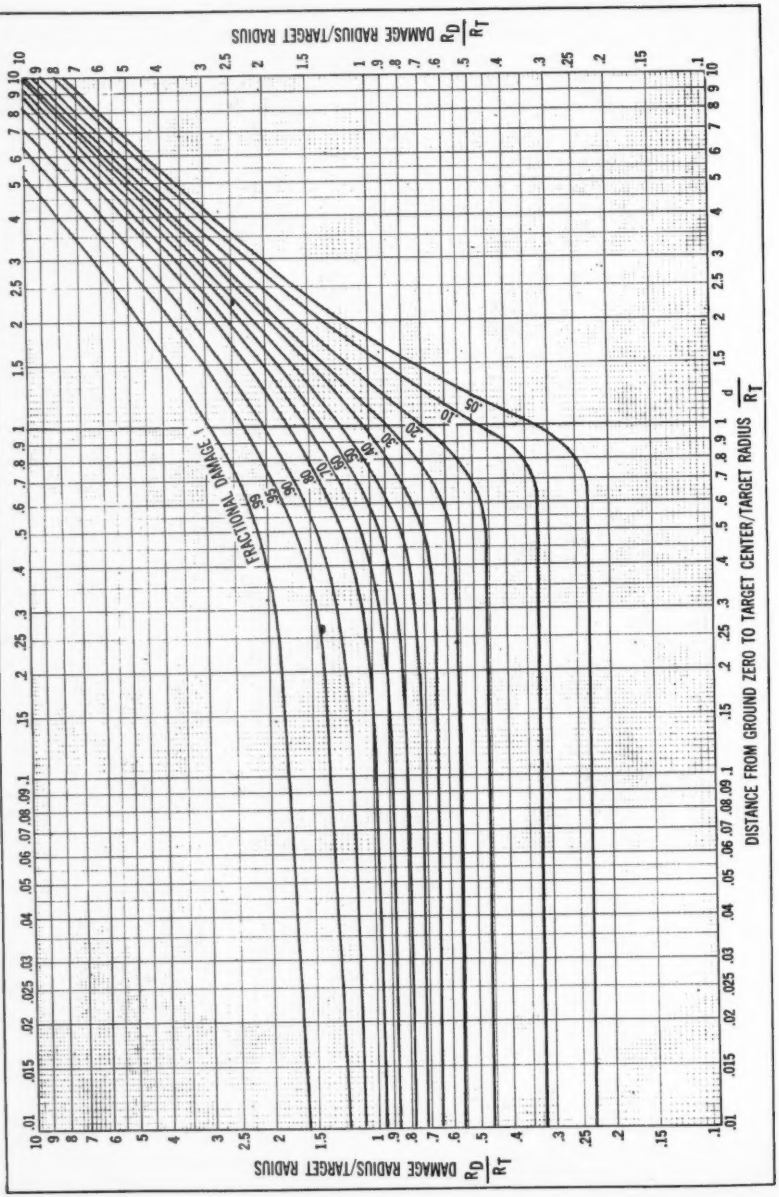


Figure 4. Nomograph for numerical analysis of area targets (zero delivery error)

at that distance from the burst can be expected to suffer damage. Generally speaking, about 85 percent of all the target elements *within* a damage radius will be damaged, that is, damage within the circle described by the radius of damage is so heavy that from a practical viewpoint it can be considered virtually complete. Damage may be sustained by a few target elements out to a distance of about one and a half times the damage radius, beyond which the probability of damage will be less than one percent. The term, "damage radius," may be used for both material damage and personnel casualties; for personnel, damage radius is synonymous with casualty radius.

5. All delivery systems, with the single exception of prepositioned weapons, have some delivery error. There are two other instances where no or zero delivery error is considered appropriate when estimating damage and casualties: poststrike analysis after the location of actual ground zero has been determined; and analysis of vulnerability of friendly units or installations to enemy nuclear attack. In the latter case, ground zero is assumed

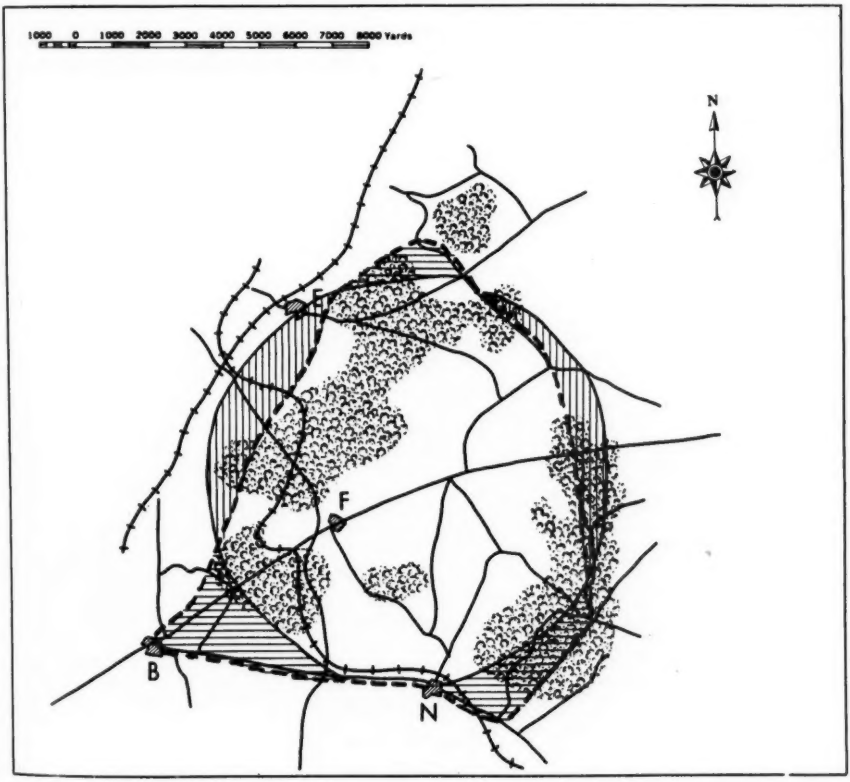


Figure 5.

Figure 4. Nomograph for numerical analysis of area targets (zero delivery error).

to be at the worst possible place which is usually the center of the target area being analyzed, and where maximum damage would result.

Assumptions

For our analysis several assumptions must be made.

First, it will be assumed that megaton yield weapons available to the enemy are 1 megaton and five megaton, both having a surface burst capability. (Under wartime conditions, intelligence will indicate the yields the enemy is assumed to possess.)

Second, our matériel will behave the same as the enemy's in response to the blast effects of nuclear explosions.

Third, when analyzing the vulnerability of friendly installations and units to enemy nuclear attack, it is desirable to consider the results of less severe effects including delayed casualties. (Figure 1 contains values of damage and casualty radii which will be used in the solutions of problems in this article.)

Figure 6.

Fourth, analysis of friendly installations and units should be based on the assumption that no warning of an impend-

ing enemy nuclear attack will be received. Troops should be considered as having foxhole (or equivalent) protection or being shielded from direct thermal radiation only if this degree of protection or roadside storage. Operating personnel will be shielded from direct thermal radiation, that is, they will be either in buildings or in forests, or in the open but with the exposed skin of hands and faces protected

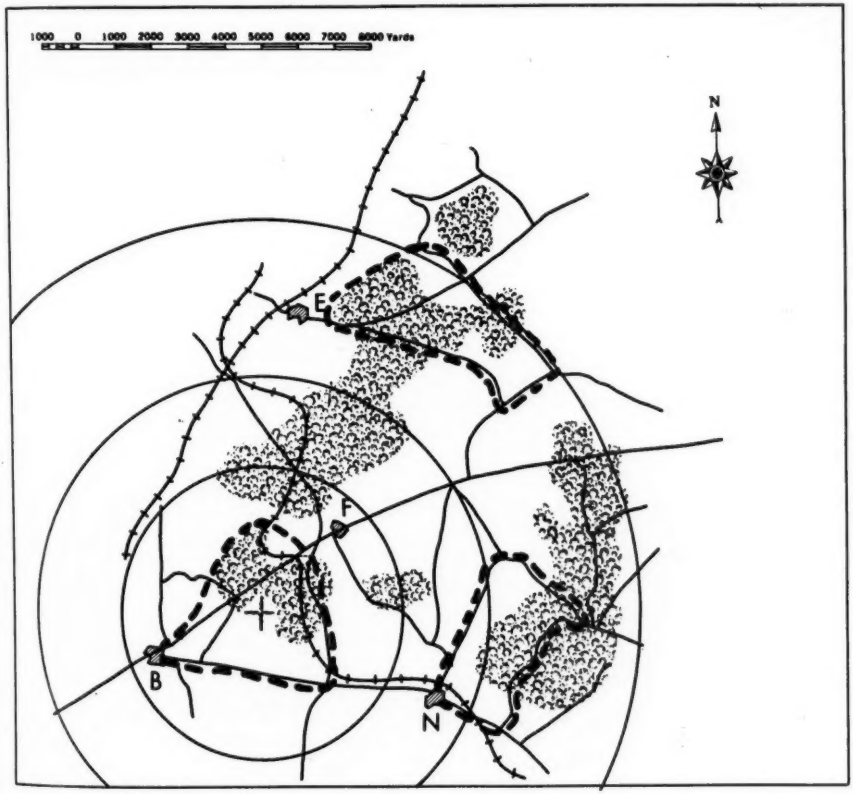


Figure 7.

shielding is expected to prevail even though no warning is received.

First Plan

Two plans for area storage of class V supplies will be analyzed. Figure 2 shows a proposed area for an ordnance class V depot in a field army service area. Ammunition will be stored uniformly throughout the area, making maximum use of by gloves, goggles, hoods, and, perhaps, face cream. The commander has stated that he will accept the risk of losing not more than one-third of the ammunition to a one-weapon attack. Assume that the G2 has reported that the enemy has employed yields of approximately five megatons on rear area targets, burst on the surface.

A template can be made to reflect the necessary radii of damage and casualties associated with the environmental condition of matériel and personnel as indicated on Figure 1.

1. R_D (supply and maintenance areas) = 3,750 yards.

2. Casualty radius (troops in the open, other than burns on exposed skin) =6,250 yards.

3. Casualty radius (troops in cities, and troops in forests, not dug in) = 10,400 yards.

Figure 3 shows the center (or ground zero cross) of a template with these radii placed at the estimated center of the proposed area. It can be seen that the area within the inner (or damage) circle is more than one-third and apparently less than one-half of the total proposed area. (Recall also that beyond a distance of one and one-half R_D no damage occurs.) At the same time, note that casualties from initial effects will be very heavy since the two casualty radii extend well beyond the proposed area. (Determination of casualties from fallout will be treated separately later in this article.) This proposal

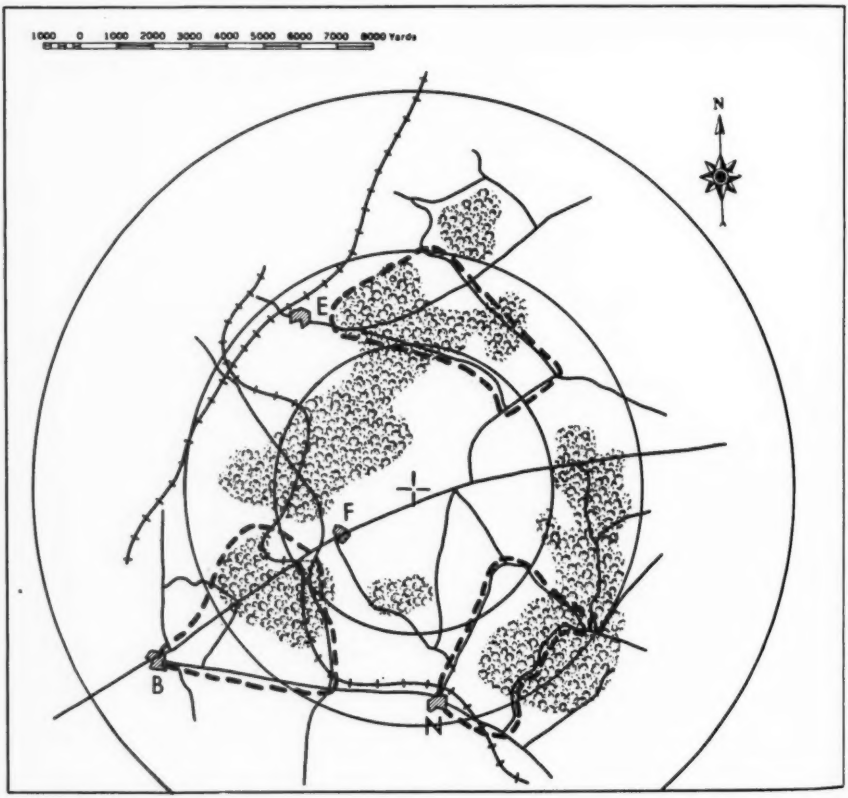


Figure 8.

fails to meet the commander's requirement with respect to the loss of supplies he is willing to accept. To substantiate this visual approximation of damage and casualties, the specific fraction of damage and casualties can be calculated by the numerical method.

Numerical fractions of damage to area

along the left vertical edge of the figure. In this instance R_D is 3,750 yards. It is now necessary to estimate (or calculate) the R_T, or the radius of a circle with an area equivalent to the proposed area. Since the latter is of an irregular shape—not rectangular, elliptical, or circular—the R_T may be estimated by the use of a

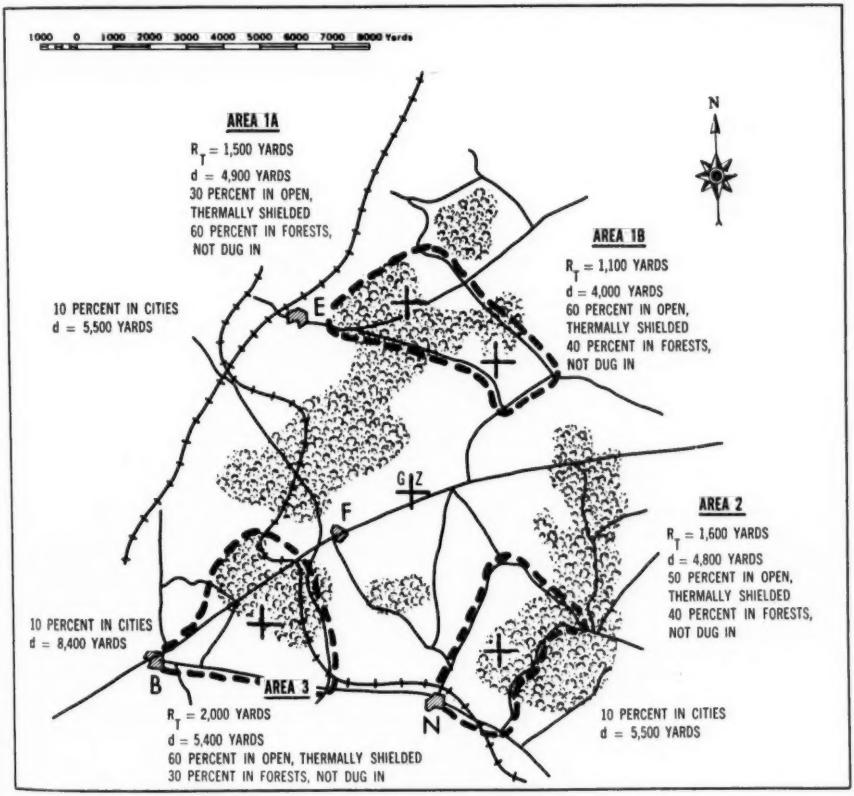


Figure 9.

targets can be obtained by using Figure 4. Note that the horizontal ratio is $\frac{d}{R_T}$ and the vertical ratio is $\frac{R_D}{R_T}$. When target center is assumed as actual ground zero for a nuclear burst, *only* the $\frac{R_D}{R_T}$ ratio is used

pencil compass, using target center as the center of the equivalent circle. Using trial radii, one attempts to define a circle where the areas outside the target area but within the trial circle are approximately equal to the areas outside the trial

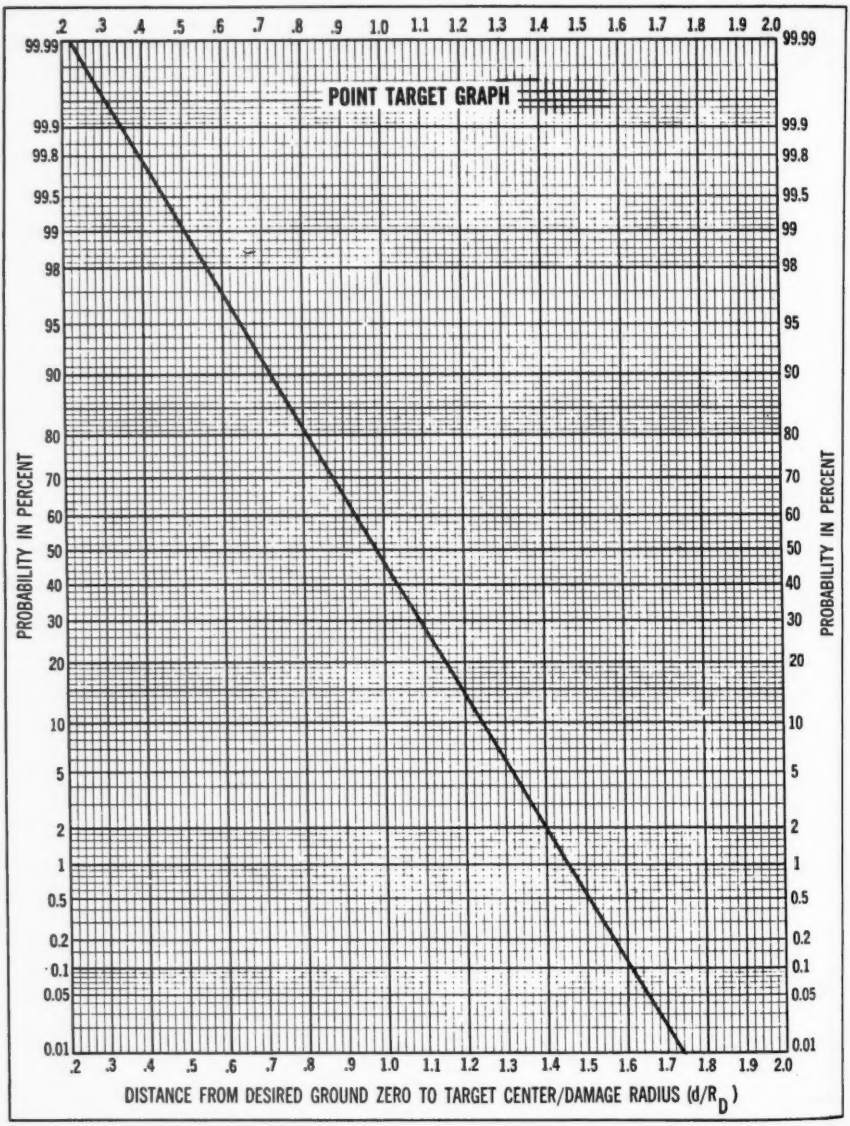


Figure 10. Point target graph extension for numerical analysis of point targets (zero delivery error)

circle but within the target area. This condition is depicted in Figure 5 where the vertically shaded areas approximate the horizontally shaded areas. Here the R_T is measured as 5,400 yards.

The ratio of $\frac{R_D}{R_T}$ is $\frac{3,750}{5,400}$ which equals 0.695. Along the left vertical edge of Figure 4 note that this value falls between the fractional damage contours of 40 and 50 percent. Actually, it is slightly more than halfway between these contours and the fraction of damage is about 46 percent. This verifies the template approximation of between one-third and one-half. Similarly, for casualties to troops in the open the value of $\frac{R_D}{R_T}$ is $\frac{6,250}{5,400}$ or 1.16 and the fraction of casualties is about 93 percent; for casualties to troops in cities and in forests, not dug in, $\frac{R_D}{R_T}$ is $\frac{10,400}{5,400}$ or 1.92 and the fraction of casualties is over 99 percent.

Second Plan

It is obvious that this plan does not meet the commander's requirement. The plan in Figure 6 shows intrafacility dispersion for the same ordnance class V depot, each area having equal balanced stockage of ammunition. Again ammunition will be stored uniformly throughout each area, making maxium use of roadside storage. Operating personnel are protected as before.

Figure 7 shows the center of the same template placed at the estimated center of the southwest facility. A five-megaton weapon burst over this—or any—facility center will damage completely only those supplies within that facility while the other two facilities will be undamaged. Note that the two casualty radii again indicate that the *total* over-all casualties will still be heavy but not nearly as much as those estimated (and calculated) for the proposed area shown in Figure 2.

For this facility the R_T is 2,000 yards and R_D is still 3,750 yards. The ratio $\frac{R_D}{R_T} = \frac{3,750}{2,000}$ which equals 1.875. Again on the left vertical edge of Figure 4 note that this value falls above the fractional damage contour of 99 percent. This almost complete damage to supplies is to be expected in this case since the most intense blast effects cover the entire facility. Similarly, for casualties the value of $\frac{R_D}{R_T}$ will be even greater and the fraction of casualties is also over 99 percent.

For the southeast facility the R_T is 1,600 yards and the R_D is still 3,750 yards. In this instance the actual ground zero at the center of the southwest facility is 6,600 yards away from the center of the southeast facility. When calculating the damage (or casualties) to an area target when the ground zero is not coincident with the target center, Figure 4 is used by merely reading the fractional damage contour (or interpolating visually between contours) at the intersection of the values for $\frac{R_D}{R_T}$ and $\frac{d}{R_T}$. Here the ratio of $\frac{R_D}{R_T}$ is $\frac{3,750}{1,600}$ which equals 2.34, and the ratio of $\frac{d}{R_T}$ is $\frac{6,600}{1,600}$ which equals 4.13. The intersection of these two values indicates a fractional damage of less than five percent. For casualties to troops in the open $\frac{R_D}{R_T} = \frac{6,250}{1,600} = 3.9$ and $\frac{d}{R_T} = 4.13$, and their intersection indicates a fractional casualty between 30 and 40 percent. That is, about 35 percent of the troops in the open in this facility at the time of burst should become casualties. Similarly, for troops in forests not dug in $\frac{R_D}{R_T} = \frac{10,400}{1,600} = 6.5$ and $\frac{d}{R_T} = 4.13$, and their intersection indicates a fractional casualty between 90 percent and 95 percent (about 93 percent). In a similar manner, the damage and casualties to the north facility can be calculated numerically.

Less Casualties

Figure 8 shows the center of the template placed at the geometric center of this target complex. It can be readily seen that the inner (or damage) circle overlaps very small portions of the three facilities and the total damage is much less than the maximum one-third acceptable to the commander. Further, casualties still are heavy but not nearly as much as those estimated (or calculated) for the proposed area shown in Figure 2.

Figure 9 again shows the intrafacility dispersion of the ordnance class V depot. Damage and casualty estimation will be performed assuming a five-megaton weapon burst on the surface at the estimated geometric center of this depot complex.

The north area has been divided into two smaller areas, 1A and 1B. The reason is that when a nearly rectangular, or elliptical, shape target has one of its axis equal to more than twice the other axis, the R_T of the equivalent area circle will be seriously in error. In such cases, it is necessary to subdivide the target so that one axis is not more than twice the other for these subtargets.

Each target area has its center marked with a cross. The distance of these target centers from the assumed ground zero is indicated by the values of d. The distance between buildings in a city, housing administrative and stock record personnel, and the assumed ground zero is shown also. The expected disposition of personnel at any time is shown in percentages for each area, each facility containing one-third of the personnel on shift. Assume further that the depot is operating on two 12-hour shifts with the personnel of the off shift quartered in buildings well away from the depot complex area.

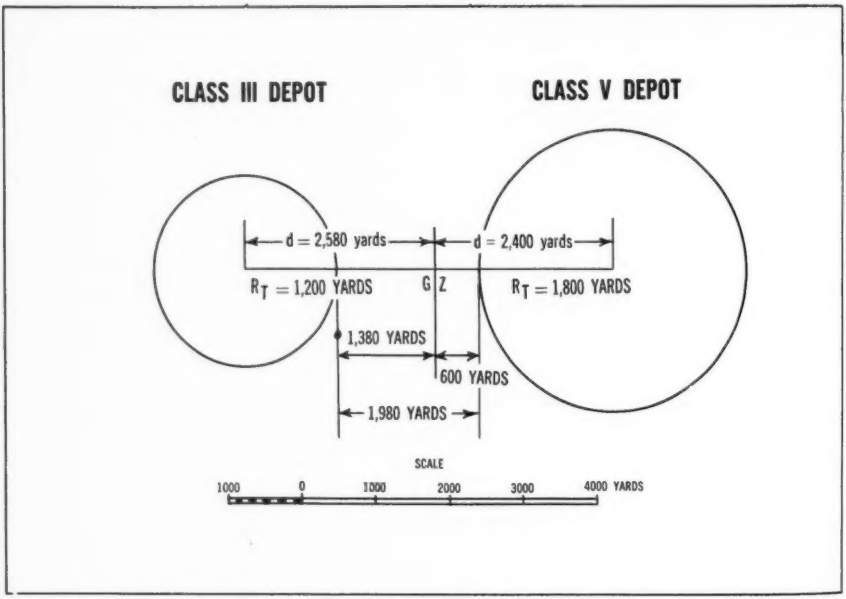


Figure 11.

Probability of damage to point targets (a single element such as a building or bridge or several elements comprising a *small* area target) when the delivery error is zero can be obtained by using Figure 9. Note that the horizontal ratio is $\frac{d}{R_D}$. For any given value of $\frac{d}{R_D}$, enter the bottom horizontal line and move vertically upward to intersect the diagonal line. At this intersection, move horizontally to the right (or left) to read the value of probability along the vertical scale. For example, a building is located 2,420 yards from ground zero. If R_D is 2,200 yards, the value of $\frac{d}{R_D}$ is $\frac{2,420}{2,200} = 1.1$. Enter the bottom horizontal line at 1.1, move vertically upward to intersect the diagonal line, then move horizontally to the right to read a probability of damage of 28 percent.

The value of probability obtained from Figure 10 is interpreted differently for a small-area target composed of several elements. For example, take a group of buildings housing 100 troops. Using the damage radius for casualties to troops in buildings, if these buildings are considered a point target and the probability of damage is determined to be 40 percent, this means that *on the average* 40 individuals should become casualties.

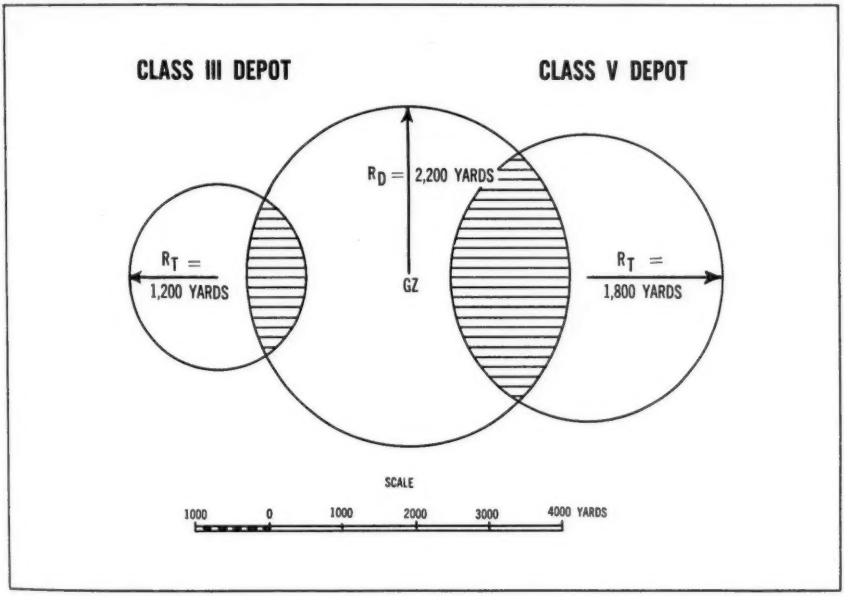


Figure 12.

Calculations

Following are the detailed calculations of damage and casualties for the conditions stated on Figure 9 for Area 1A only.

1. Damage:

$$\frac{R_D}{R_T} = \frac{3,750}{1,500} = 2.5$$

$$\frac{d}{R_T} = \frac{4,900}{1,500} = 3.27$$

Figure 4, f = 0.13

Assuming Area 1A has one-sixth (one-half of the one-third contained in the north facility) of the total class V supplies: percent damage = 0.13 × 0.167 = 0.022 or about two percent.

2. Casualties:

a. Troops in open, thermally shielded:

$\frac{R_D}{R_T} = \frac{6,250}{1,500} = 4.17$

$\frac{d}{R_T} = \frac{4,900}{1,500} = 3.27$

Figure 4, f = 0.78

b. Troops in forests, not dug in:

$\frac{R_D}{R_T} = \frac{10,400}{1,500} = 6.94$

$\frac{d}{R_T} = \frac{4,900}{1,500} = 3.27$

Figure 4, more than f = 0.99

c. Troops in cities:

$\frac{d}{R_D} = \frac{5,500}{10,400} = 0.53$

Figure 10, P = 0.986

d. Total percentage of casualties = (0.78 × 0.30) + (0.99 × 0.60) + (0.986 × 0.10) = 0.23 + 0.60 + 0.10 = 0.93.

Assuming Area 1A has one-sixth of the total personnel on shift: over-all total percentage = 0.93 × 0.167 = 0.155 or 16 percent.

In a similar manner damage and casualties to the other areas can be computed. (It is suggested that the reader perform the calculations for Areas 1B, 2, and 3 recalling that each facility has one-third of the class V supplies and of the operating personnel, with Areas 1A and 1B having equal stocks and operating personnel). A recapitulation follows:

1. Damage: aggregate total (Areas 1A, 1B, 2, and 3) = 0.02 + 0.06 + 0.05 + 0.02 = 0.15 or 15 percent.
2. Casualties: aggregate total (Areas 1A, 1B, 2, and 3) = 0.16 +0.16 + 0.30 + 0.25 = 0.87 or 87 percent.

Again these numerical calculations substantiate the estimated approximate results of the template method. The commander's damage requirement is met, but almost all of the shift on duty at the time of burst should become casualties.

This analysis emphasizes two important points:

1. Vulnerability of supplies is lessened when they are dispersed in an appropriate number of smaller areas within a depot area.

2. The best protection for personnel is to be under cover at the time of burst. Operating personnel should remain under cover as much as possible and expose themselves only in the performance of assigned duties. Depot commanders must ensure that such a procedure is followed strictly and that off-shift personnel are quartered well away from the depot area in order to minimize casualties.

Dispersion Distance

The preceding paragraphs illustrated the use of the template and numerical methods to analyze friendly installations to determine their vulnerability to nuclear attack. The question may arise: How does one calculate the dispersion distance between installations in the first place? This depends upon the assumed enemy nuclear weapon yield (from which R_D is derived), the physical areas of each of the installations to be dispersed (from which R_T is derived), and the calculated loss risk (fraction of damage) the commander is willing to accept. Note that three of the four variables of Figure 4 are now fixed: R_D, R_T, and f. It is only necessary to determine d, the distance from ground zero to target center. An example follows:

A quartermaster class III depot (R_T = 1,200 yards) and an ordnance class V depot (R_T = 1,800 yards) are to be located adjacent to each other. The army commander does not wish to lose more than one-fourth of the class III and one-

third of the class V supplies as the result of a one-weapon attack, assuming that the enemy will use a one-megaton weapon, burst on the surface. What is the required distance between the peripheries of these depots?

1. R_D (supply and maintenance areas) = 2,200 yards.

2. For the class III depot:

a. $\frac{R_D}{R_T}$ $\frac{2,200}{1,200} = 1.83$

b. $f = 0.25$

Figure 4, $\frac{d}{R_T} = 2.15$

c. $d = 2.15 \times R_T = 2.15 \times 1,200 = 2,580$ yards.

3. For the class V depot:

a. $\frac{R_D}{R_T} = \frac{2,200}{1,800} = 1.22$

b. $f = 0.33$

Figure 4, $\frac{d}{R_T} = 1.33$

c. $d = 1.33 \times R_T = 1.33 \times 1,800 = 2,400$ yards.

4. Distance between peripheries = (2,580 + 2,400) − (1,800 + 1,200) = 4,980 − 3,000 = 1,980 yards.

Figure 11 depicts this situation graphically. Figure 12 shows graphically the R_D overlapping about one-fourth of the class III depot and about one-third of the class V depot.

Different Approach

This problem could just as easily have been stated by the commander to involve the probability of damage to the nearest point on the peripheries of each installation rather than a fraction of damage to each installation. For example, how far apart must the peripheries of these two installations be to permit not more than a 10 percent probability of damage to the nearest points on the peripheries from a one-weapon attack? Since points are involved, Figure 10 must be used. Note that two of the three variables are now fixed: probability and R_D. It is necessary to determine d, the distance from ground zero to the target center (in this case, the point itself).

1. Entering the right vertical scale at 10 (the given probability), move horizontally to the left to intersect the diagonal line. At the point of intersection move vertically downward to read a $\frac{d}{R_D}$ value of 1.24.

2. R_D = 2,200 yards (from the preceding example).

3. $d = 1.24 \times R_D = 1.24 \times 2,200 = 2,730$ yards.

4. Distance between peripheries = $2 \times 2,730 = 5,460$ yards.

Figure 13 depicts this situation graphically with R_D included. Since there is no overlap, there is apparently no damage to either of these installations from a one-megaton weapon, burst on the surface, at a ground zero located 2,730 yards away from the nearest points on the peripheries. However, attention is directed to items 3 and 4 under the paragraph which discussed the concept and distribution of damage. At the R_D distance of 2,200 yards there is a 50 percent probability of damage. It is logical to expect distances corresponding to values of probability smaller than 50 percent to be greater than 2,200 yards. At a distance of 2,730 yards from ground zero there is a 10 percent probability of damage at that point.

These two examples illustrate the influence that the commander's requirement for acceptable loss has on the required amount of dispersion and why there is no "set" distance that will take care of all situations. It is true that if the enemy decides to use two weapons, one on each target area, no amount of dispersion would help. Further, if the one weapon that has been assumed does not burst at the selected ground zero, there will be more damage to one of the depots but conversely, less to the other. This is a calculated risk that has to be taken.

Fallout

Surface bursts have been used in the preceding problems, but fallout has been ignored temporarily. It is considered logical for the enemy to use a surface burst weapon in the attack of rear areas to cause maximum damage, disorganization, and interruption of supplies. Surface bursts, particularly of large-yield weapons, can contaminate areas of hundreds of square miles. The best defense, of course, is to eliminate or reduce, if and where possible, the enemy's capability to launch such a nuclear attack. However, plans to cope with fallout must be prepared if, in fact, fallout occurs or is expected to occur.

Determination of the extent of the fallout area is a technical problem to be solved by a nuclear weapons employment officer. The current method for plotting a fallout pattern is called the US Army fallout prediction system. It defines an envelope which will contain all of the *military significant* fallout together with the arrival times of fallout. The system does not attempt to predict intensities (dose rates) within the envelope. Intensity is one of the variables needed to calculate total doses of radiation incurred either by entering and staying in a fallout area or traversing such an area. Hence it is necessary to obtain intensity data by monitoring or by a radiological survey. Once intensity and location are known, risks involved in operations in the fallout area can be determined.

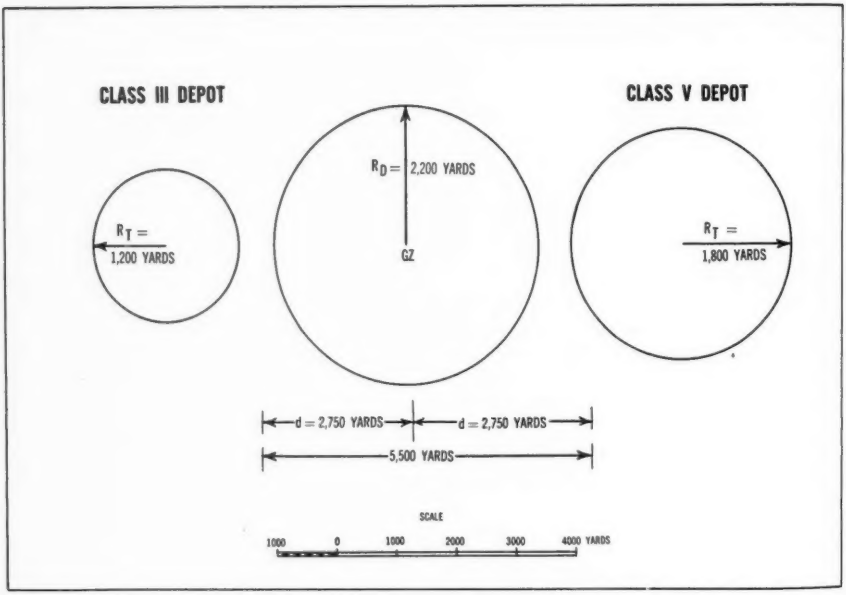


Figure 13.

Rear Area Security Controller

After a surface burst has occurred in the rear area, the rear area security controller will want answers to such questions as:

What units or installations will be adversely affected in their present locations?

At what time will fallout arrive on various units and installations?

What units are in the area of immediate arrival of fallout which precludes their movement out of the area?

At what time can these (and other) units safely move out or be moved out of the area?

What units must increase their protective capability?

by these plans and policies, the rear area security controller obtains decisions from the army commander through the army G4 in those cases involving service units and through the army G3 in those cases involving combat units.

Protective Measures

Appropriate measures can be taken to counter or minimize the effects of the fallout hazard. These include individual and unit protective measures and, if sufficient warning time is available and prior planning has been accomplished, movement out of the area. Under conditions of expected or suspected radiological contamination, the action to be taken is based on the mission as the overriding consideration. Movement out of a contaminated area should be attempted only after radiological monitoring or survey assures that significantly less radiation will be received by such action.

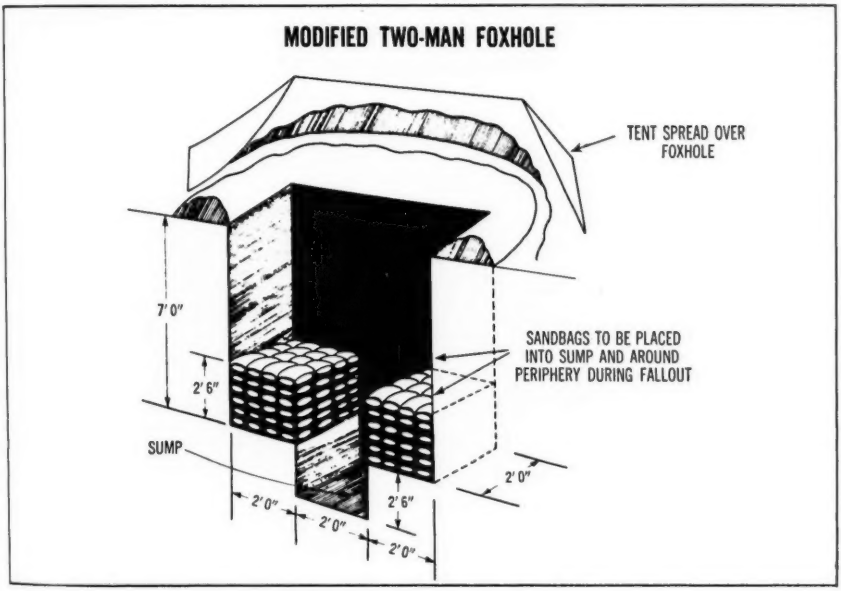


Figure 14.

Later on, questions to be answered would include:

When can units that have left return to their depot areas?

What are the times of entry and stay in fallout contaminated areas for repair, rescue, decontamination, and other teams?

Having obtained the answers to these questions, the rear area security controller acts in accordance with the approved damage control plans and policies of the army commander. In those instances not covered

Passive protective measures include the use of foxholes, collective shelters, and decontamination. Figure 14 illustrates a modified two-man foxhole. The cover over the foxhole reduces the amount of radioactive dust which could have entered. By scraping with a shovel the area around the foxhole out to arm's length and throwing this spoil away—as well as those particles that may have drifted into the shelter—from the foxhole, the occupants should be large enough to provide sufficient room in which to move around and to sleep.

Figures 16 and 17 show two examples of expedient shelters which can be used to reduce the effects of the fallout hazard effectively.

Operations in Fallout Area

Operations in a fallout area can be planned. The factors involved are acceptable risk (total dose that should not be exceeded), stay time in the area, protection factors (if any), entry time into the area (or time of arrival of fallout), and intensity. To solve such problems it is necessary to use Figure 18 [1] or Figure 19 [1], and Figure 20 [2].

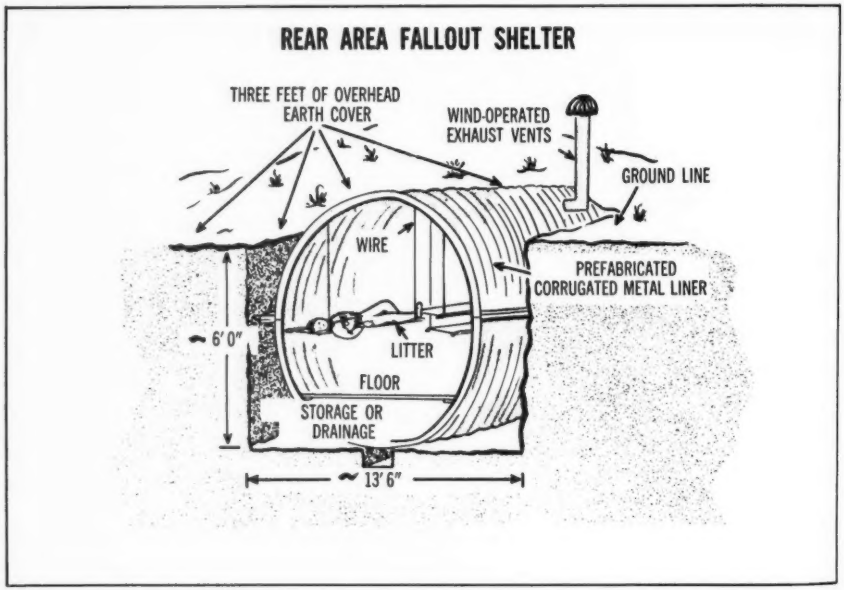


Figure 15.

decrease further the amount of radiation received within the foxhole. By digging deeper, personnel increase their distance from the fallout on the ground surrounding their foxhole, further reducing the radiation which will reach them after having passed through the earth.

Figure 15 illustrates a collective shelter. It provides the best protection for manhours expended by combat support and other rear area units. This type of shelter

There are two general types of opera-

[1] Department of the Army Pamphlet 39-3, *The Effects of Nuclear Weapons*, 1 May 1957, Figures 12.107 and 12.108.

[2] Department of the Army Pamphlet 39-1, *Atomic Weapons Employment*, June 1956, Table V.

tions in fallout contaminated areas: entry into and occupancy of an area for a period of time, and traverse of an area. Several examples follow:

Situation.—The enemy has burst a nuclear weapon on the surface in the field army service area. From monitoring readings reported by units in the fallout affected area and aerial radiological survey, a nuclear weapons employment officer has determined that the intensity at one hour after the burst was 1,000 roentgens per hour at a particular depot. The rear area security controller has alerted a helicopter to land a damage control party at the depot to check it. The army SOP states that personnel exposed to fallout should receive not more than 25 roentgens total dose. Assuming it will take 30 minutes for the damage control party to complete its check, what is the earliest time the party can enter the area?

Solution.—Figure 18 will be used since it is based on intensity at one hour after the burst. This figure has the following variables: entry time; stay time; and multiplying factor (total dose divided by intensity at one hour after burst or $\frac{D}{I_1}$). The first step is to find the multiplying factor, $\frac{D}{I_1}$ or $\frac{25}{1{,}000} = 0.025$. Next, enter the bottom horizontal line with this value and move vertically upward to intersect the stay time contour labelled 30 minutes. At the point of intersection move horizontally to the left vertical edge to read time after explosion (or entry time). In this instance, earliest entry time is 12 hours after the explosion.

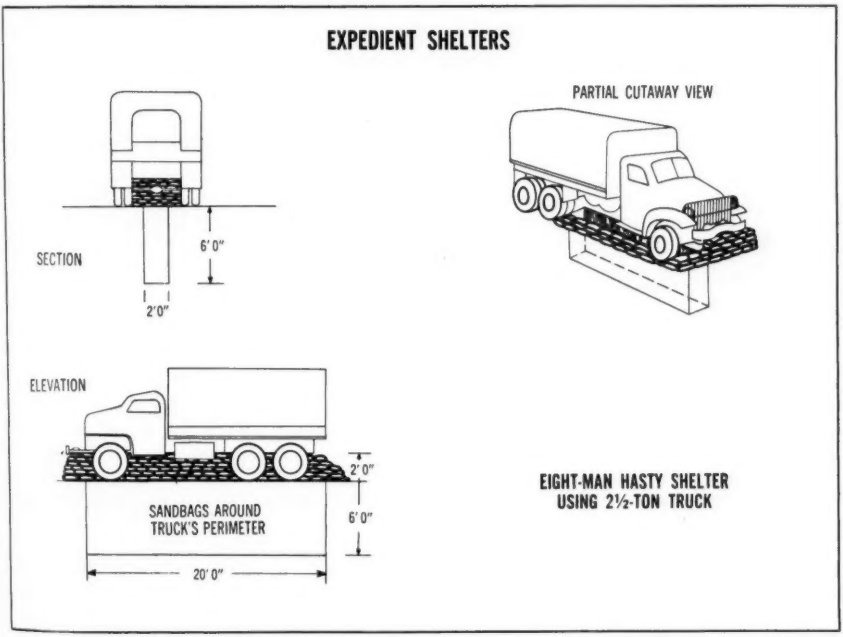


Figure 16. Eight-man shelter using 2½-ton truck

Situation.—The enemy has burst a nuclear weapon on the surface in the field army service area. At the depot area of interest troops are in foxholes when fallout arrives two hours after the burst at their position. Readings taken from instruments at this time indicate an intensity of 500 roentgens per hour outside the foxholes. For a stay time of two hours, time contour labelled 2 hours. Move vertically downward to the bottom horizontal line to read a multiplying factor or $\frac{D}{I_t}$ value of 1.3. Total dose equals 1.3 times intensity at time of entry or 1.3 × 500 which is 650 roentgens. However, since troops are afforded some protection by foxholes, a protection factor of 0.1 is in-

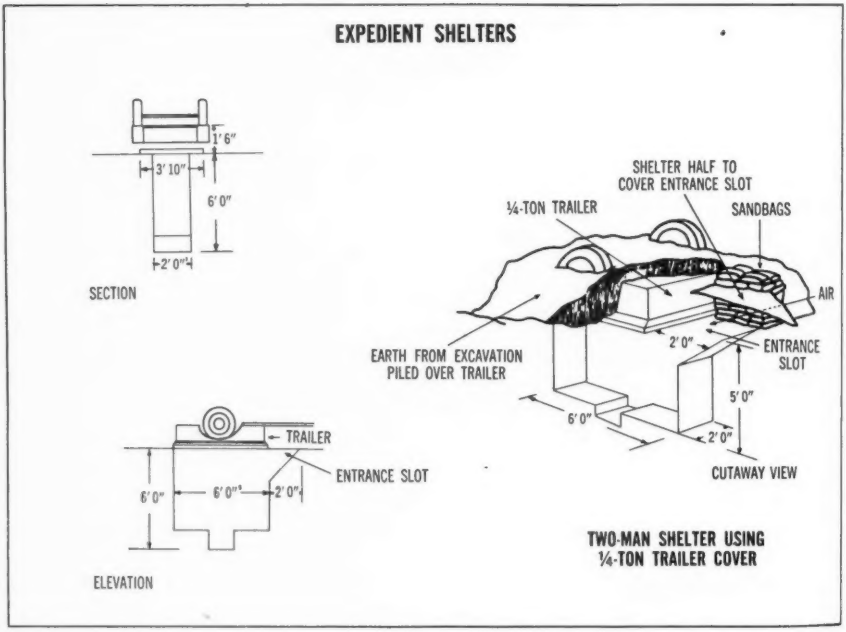


Figure 17. Two-man shelter using ¼-ton trailer cover

dicated in Figure 20. This means that the total dose inside the foxhole is only 10 percent of the total dose outside the foxhole. In this case 650 × 0.10 = 65 roentgens received by troops in foxholes.

what will be the total dose of radiation received by these troops?

Solution.—Figure 19 will be used since it is based on intensity at entry time (or time of arrival of fallout). Again, three variables are fixed: intensity at time of arrival of fallout, entry time, and stay time. It is necessary to find total dose only. The first step is to enter the left vertical edge at an entry time of two hours. Move horizontally right to intersect the stay

Further Examples

Situation.—The enemy has burst a nuclear weapon on the surface in the field army service area. Subsequently, monitored intensity readings received from

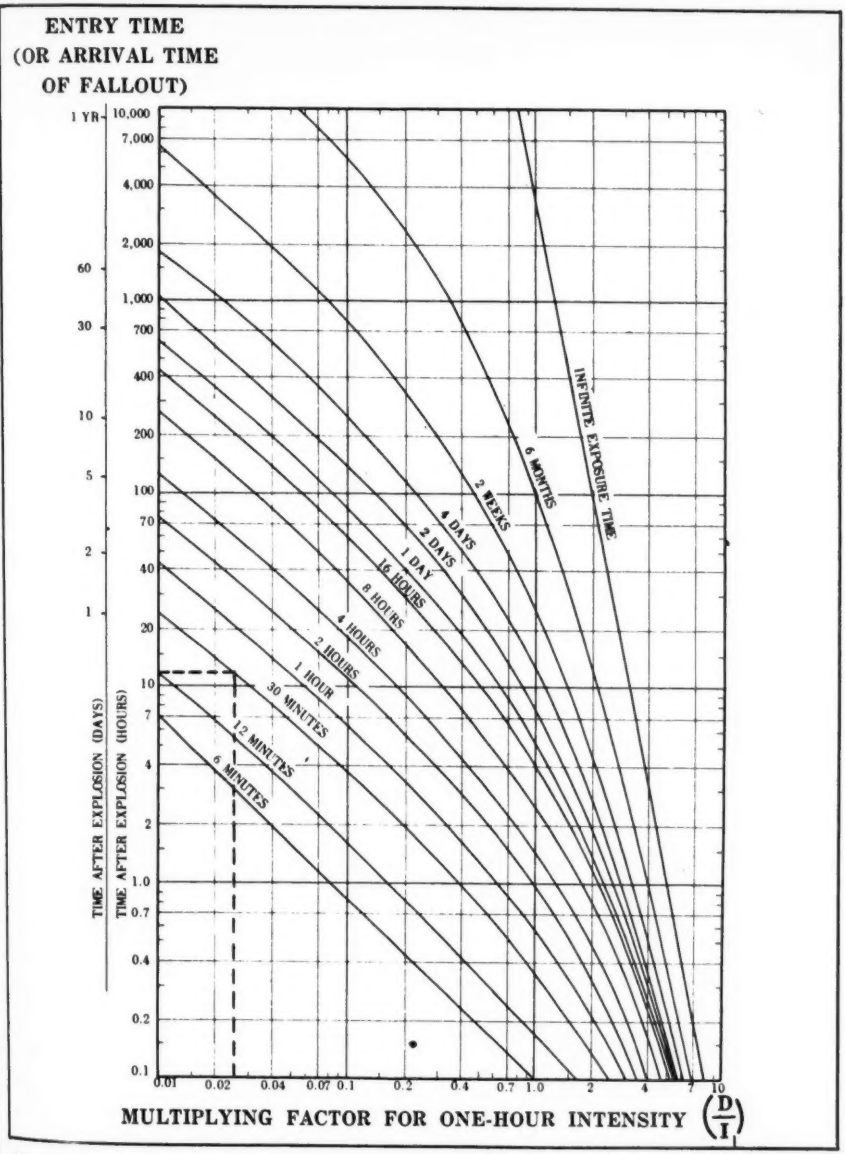


Figure 18. Total (accumulated) radiation dose due to fallout in a contaminated area based on one-hour reference intensity

units in the fallout area are analyzed by a nuclear weapons employment officer. From these readings, he plots the actual fallout pattern with intensities referenced to one hour after burst. For the depot area of interest, the intensity at one hour after burst is 1,200 r/hr. Information of the fallout hazard is received by the depot commander at H + 0.5 hours and he orders his personnel into foxholes. Fallout starts to arrive at H + 0.75 hours. At H + 3.5 hours, the depot commander receives instructions to move his unit to a specific area free from fallout 15 miles away. Previous practices of the SOP for personnel movement indicate an average of 15 minutes to bring 2½-ton trucks to the depot area to pick up personnel and start the move. Assuming that the trucks travel at 30 miles per hour, what is the total dose received by depot personnel until the time they arrive at the area free from fallout?

Solution.—All personnel are in foxholes from time of arrival of fallout to H + 3.5 hours. Assume that personnel getting trucks ready to depart the area are exposed to ambient intensities, that is, no protection factor; meanwhile, other depot personnel remain in foxholes to H + 3.75 hours when they enter trucks and move out immediately. Thereafter, all personnel receive the same dose while traversing the fallout area.

1. Troops in foxholes (drivers):

a. From H + 0.75 to H + 3.5 hours: entry time is 0.75 hours (arrival of fallout), stay time is 2.75 hours. From Figure 18, $\frac{D}{I_1} = 1.35$. Intensity at one hour after burst is 1,200 r/hr; protection factor for foxholes is 0.1 (Figure 20). Substituting and applying the protection factor, the total dose is 1.35 × 1,200 × 0.1 or 162 roentgens.

b. From H + 3.5 to H + 3.75 hours: drivers are receiving the full ambient intensity. Entry time is 3.5 hours, stay time is 15 minutes. From Figure 18, $\frac{D}{I_1} = 0.055$. Substituting, total dose is 0.055 × 1,200 or 66 roentgens.

2. Troops in foxholes (depot personnel other than drivers) from H + 0.75 to H + 3.75 hours: entry time is 0.75 hours (arrival of fallout), stay time is three hours. From Figure 18, $\frac{D}{I_1} = 1.4$. Substituting, total dose is 1.4 × 1,200 × 0.1 or 168 roentgens.

3. All personnel during traverse out of the fallout area: entry time is 3.75 hours after the burst at which time personnel are ready to move. Since intensities vary continuously in the fallout area because of radioactive decay, an *average* intensity must be determined when crossing a fallout contaminated area; usually, the average intensity is taken as one-half of the intensity at one hour when using Figure 18 with no serious error resulting. Here, the average intensity at one hour after burst is ½ × 1,200 or 600 r/hr. Stay time in the fallout area is 15 miles divided by 30 miles per hour, or 30 minutes. The protection factor for 2½-ton trucks is 0.6. Total dose received is calculated as follows: enter Figure 18 (based on intensity at one hour after burst) at the left vertical edge at 3.75 hours. Move horizontally right to intersect the stay time contour labelled 30 minutes. At this intersection, move vertically to the bottom horizontal scale to read a $\frac{D}{I_1}$ value of 0.1. In cases involving traverse of a fallout area the average intensity at one hour after burst is substituted for I_1. Therefore, total dose equals 0.1 × 600 × 0.6 or 36 roentgens.

4. Therefore, from H + 0.75 hours (time of arrival of fallout) to H + 4.25 hours (time of arrival in area free from fallout):

a. Total dose (drivers): 162 + 66 + 36 or 264 roentgens.

b. Total dose (depot personnel other

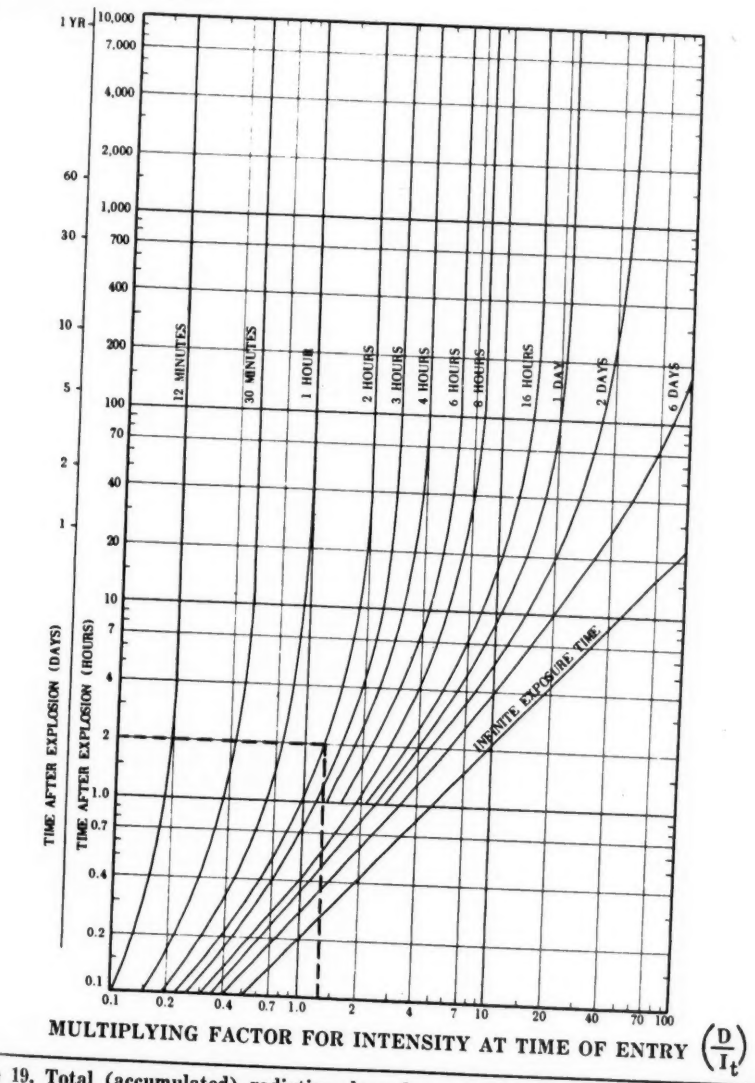


Figure 19. Total (accumulated) radiation dose due to fallout in a contaminated area based on intensity at time of entry

than drivers): 168 + 36 or 204 roentgens.

The expected effects of these radiation doses will result in 50 percent noneffectives within six hours, with about 10 percent deaths due to radiation exposure among the drivers.

Additional Calculations

Similar calculations can be made for other departure times of total dose received from time of arrival of fallout to arrival in the area free from fallout. The top curve in Figure 21 indicates total dose received by drivers, the bottom curve for depot personnel other than drivers. There is little to be gained by delaying departure to later than H + 4 hours for, although the total dose for drivers remains about the same, the total dose for other personnel increases significantly. On the other hand, departure at H + 1.5 hours, that is, total dose accumulated by H + 2 hours, gives the smallest total dose—about 170 roentgens—to personnel other than drivers but the total dose for drivers is very large—about 350 roentgens.

The middle curve is for movement out of the depot area by helicopters. A planning time of 12 minutes exposure to ambient intensities is used to account for the time it takes all personnel to move from foxholes to helicopters. Note that the minimum total dose is received if movement by helicopters is at about H + 2.25 hours.

The *general* conclusion from this type of analysis is that truck movement out of the area can be accomplished only by exposing the truck drivers to more than 250 roentgens (50 percent noneffectives, 10 percent deaths), and that this maneuver must be laid on very quickly, perhaps before the best direction for evasive action could be known, for it to reduce measurably the total dose received by the passengers. Helicopter evacuation cannot prevent any personnel from receiving at least 205 roentgens (50 percent noneffectives, no deaths). Thus there appears to be, practically speaking, little which can be done for personnel caught in high-intensity, early fallout.

Protection Factors

Protection	*Protection Factors*
Foxholes	0.1
2½-ton trucks	0.6
¼-ton trucks	0.8
Armored personnel carriers	0.25
Light tanks	0.15
Medium tanks	0.1
Concrete or timber bunkers with at least three feet of earth cover	0.003

Figure 20.

Conclusion

The need for greater dispersion of depots, brought about by the threat of the use of nuclear weapons, will reduce the number of usable storage sites within a given area. The use of many locations, highly suitable from an operational viewpoint, may be denied us because they will be too close to another such location already selected as a storage area. Conse-

quently the location problem has become more difficult, and economical use of space more important. Analyses of the vulnerability of different installations frequently result in recommendations of measures to decrease their vulnerability.

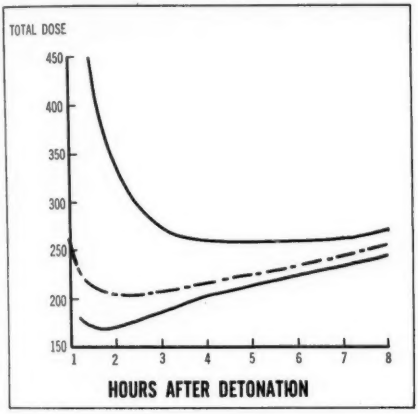


Figure 21.

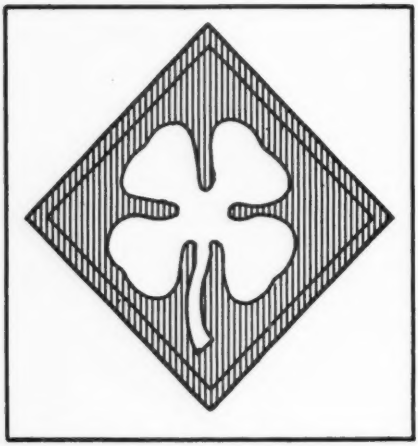
A nuclear weapons employment officer is a technical advisor to the commander and the staff. His advice and recommendations are submitted for approval, rejection, or modification. In order to supervise the activities of this specialist competently and to act confidently on his advice and recommendations, the commander and the staff must be familiar with the techniques and procedures used in an analysis of friendly installations. With this competence and confidence, commanders and their staffs can design a logistical system capable of accomplishing its essential mission in an atomic war: the continued and successful logistical and administrative support of the combat forces.

Since World War II we have continually developed new weapons and new delivery means to obtain increased and more effective firepower, both offensive and defensive. With the coming of age of nuclear weapons and guided missiles today, the manner in which a commander controls his forces has had to be revised again. Survival and victory on the atomic battlefield requires the ability to disperse our combat troops in small, independent battle groups, and then to bring them together rapidly and precisely at the decisive point of battle. There will be a much greater frequency of movement of combat elements through the air as well as over the land, creating the problem of moving in three dimensions instead of the former two. More information will be needed, and transmitted and received by more users, both within and between our tactical and logistical systems.

Lieutenant General Arthur G. Trudeau

FOURTH UNITED STATES ARMY

Material for this article was furnished by Headquarters Fourth United States Army, Fort Sam Houston, Texas.—Editor.



THE Fourth US Army is America's "Missile Army."

Steeped in frontier lore of a bygone cavalry era, the Fourth United States Army area has a major role today in pioneering ultramodern weapons and military concepts.

The power or impact resulting from its operations may be summed up aptly by referring to the area as "Talon of the American Eagle." The initial letters of each state in the area form the word "talon"—Texas, Arkansas, Louisiana, Oklahoma, and New Mexico.

Militarily speaking, how does the Fourth US Army area support its cognomen? A brief view of some of the activities will disclose the answer.

At Fort Bliss, which begins at El Paso, Texas, and extends northward into New Mexico, is found the U. S. Army Air Defense Center—the only installation of its kind in the United States. As the training center for all air defense units of the US Army, Fort Bliss is one of the most important military installations in the United States; for in event of enemy air attack, Bliss-trained soldiers, in the air defense units, will be the troops with the know-how and the equipment with which to blot enemy raiders from the sky.

At Fort Bliss so-called "pushbutton" warfare is carried to its most advanced degree. It is the place where bigger and better missiles such as the blue-chip *Nike Hercules* are integrated into the electronic guidance command system for field operations.

Key training and development activities at Fort Bliss include the U. S. Army Air Defense School, U. S. Army Training Center Antiaircraft Artillery, 1st Guided Missile Brigade, U. S. Army Air Defense Board, and Office of Special Weapons Development.

White Sands Missile Range, the largest land testing site for missiles and rockets in the United States, is located north of Fort Bliss.

Situated in the Tularosa Basin, between the San Andres and Sacramento Mountain Ranges, the Missile Range consists of approximately 4,000 square miles of desert suitable for the testing of intermediate range rockets.

Northwest from Fort Bliss is Fort Sill, Oklahoma, the U. S. Army Artillery and Missile Center, focal point for field artillery and surface-to-surface guided missile training and operation in the Continental

The Fourth United States Army area plays a major role today in pioneering our ultramodern weapons and military concepts and in key training and development activities throughout its five-state region

United States. The center is comprised of the U. S. Army Artillery and Missile School, U. S. Army Artillery Board, and the U. S. Field Artillery and Missile Training Center.

At Fort Sill the latest doctrines are written, evaluated, and then put into practice by artillery units. Not only do the men of Fort Sill learn to inflict casualties on enemy troops, they also learn to neutralize enemy artillery batteries which must be silenced.

Employed in training at Fort Sill are the *Honest John* rocket, *Lacrosse*, *Corporal*, and *Redstone* guided missiles, in addition to the 280-mm (atomic) cannon and other deadly conventional artillery weapons.

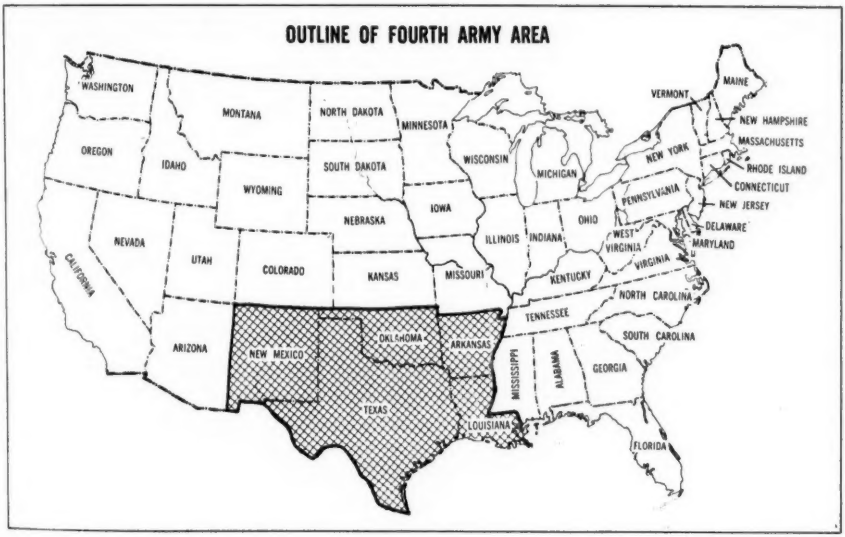
At Fort Chaffee, near Fort Smith, Arkansas, is the U. S. Army Training Center, Field Artillery, where the training of selected enlisted men as field artillery cannoneers and fire direction specialists is conducted. Reserve Forces Act personnel receive basic combat, advanced individual, and common specialist training at the fort.

Turning to central Texas and Fort Hood another part of the Army missile program is to be found. This is the 2d US Army Missile Command (Medium) which employs the *Honest John* and *Corporal* missiles in its arsenal of weapons.

Also in the Fourth US Army area is a large part of the Army's armored might and training activities.

Fort Hood, home of Headquarters III Corps and the 2d Armored (Hell on Wheels) Division, recently returned from Germany, has trained three famous armored divisions since World War II. The others are the 1st (Old Ironsides) and the 4th (Breakthrough), the latter now in Germany.

To the southeast of Fort Hood, near Leesville, Louisiana, is Fort Polk where Combat Command A of the 1st Armored Division sharpens its combat readiness. Fort Polk is headquarters for the vast Louisiana Maneuver Area, largest in the United States, consisting of approximately seven million acres. Here the Army tests its latest battle concepts, weapons, and equipment in the field.



Army aviation activities also support the nickname "Talon" given to the Fourth US Army area. As a result of the Army's requirement for greater mobility on the atomic battlefield, both the number of active duty Army aviators and the number of Army aircraft in the five states have more than doubled since 1954.

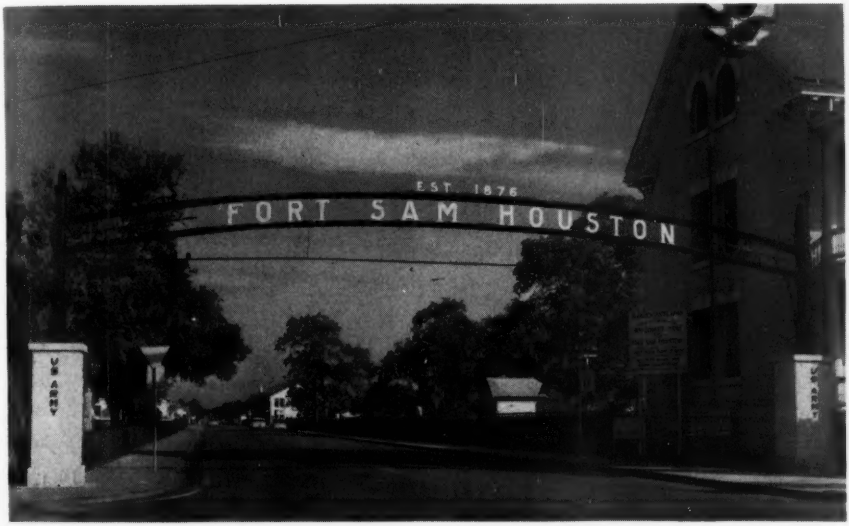
A recent count showed there were 578 active duty Army aviators and more than 700 fixed- and rotary-wing aircraft in the area. About 50 percent of the aircraft in the area are assigned to tactical units. The remainder are used in primary helicopter training at Camp Wolters, near Mineral Wells, Texas, primary fixed-wing training at Camp Gary, near San Marcos, Texas, and for command support.

Three new tactical units are being watched with special interest in the Fourth Army area. One is the SKYCAV reconnaissance squadron, a battalion-size, aviation unit within the 2d Missile Command (Medium) at Fort Hood. Another is the 4th Field Artillery Battalion's airphibious unit at the U. S. Army Artillery and Missile Center, Fort Sill, and the third is the 502d Army Aviation Company, 2d Armored Division, Fort Hood, reorganized under the new Pentomic concept.

The airphibious artillery unit at Fort Sill—the Army's first—is an experimental unit now undergoing tests. It is equipped with various highly mobile artillery weapons including howitzers and rocket launchers all transported by helicopters. As a supermobile unit it will provide fast fire support in normal operations as well as for airborne, armored, and other types of combat units in situations where mobility is essential.

75-mm howitzer *M1*

Another important installation of the Fourth US Army area is Fort Sam Houston in South Central Texas. Located at San Antonio, it is the home of Brooke Army Medical Center, hub of the Army's medical field training. Here, in addition, is Headquarters Fourth US Army, nerve center and command post for most of the Army activities in the half-million square mile Army area as indicated in the following official US Army photographs.

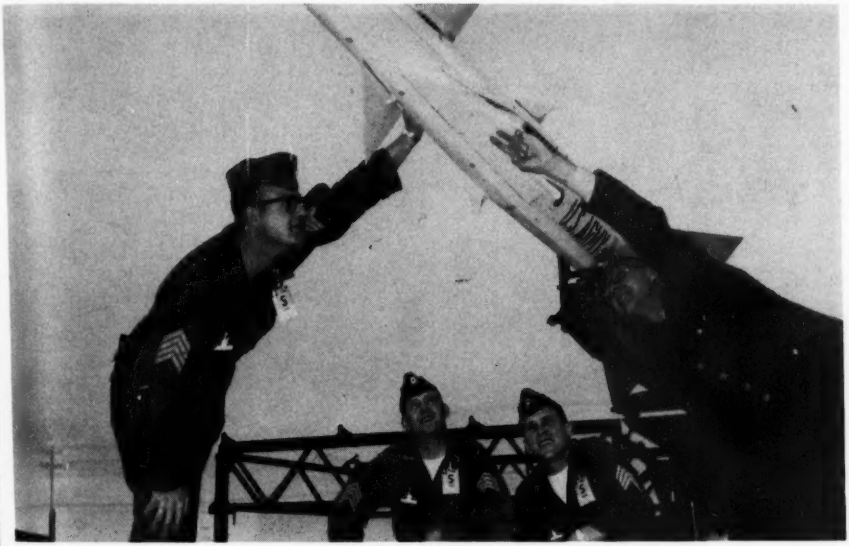


Above, is the south entrance to Fort Sam Houston, Texas, location of Fourth US Army Headquarters. Below, the Army's *Jupiter C* missile which carried the first US satellite around the world blends with an antique vintage cannon, a landmark in the famous US Fourth Army Quadrangle. The *Jupiter C* rocket float was designed at Fort Sam Houston.

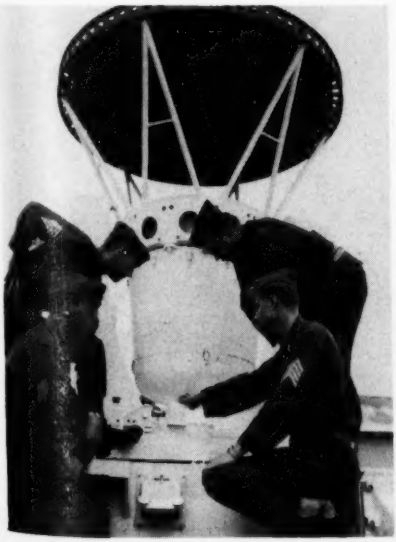
Above left, is the clock tower in the Quadrangle, Headquarters Fourth Army. Above right, the main hospital at Brooke Army Medical Center, hub of the Army's medical field training at Fort Sam Houston. Below, are shown the *TL-19I's* massed on Gary Army Air Field at San Marcos, Texas, the US Army's primary fixed-wing flight training center.

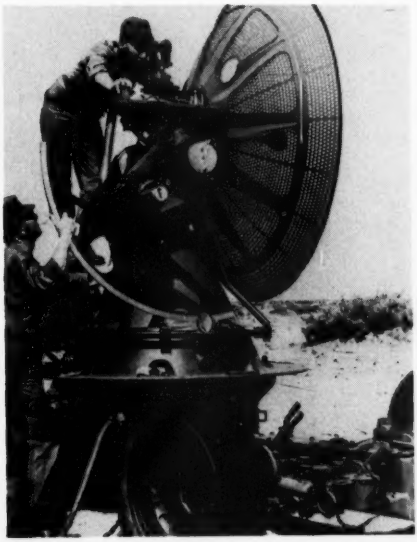
Above, the close order landing advantages of the Army helicopter are seen as two *H-23's* follow each other in closely to the flight pad at Camp Wolters, Texas, site of the US Army's Primary Helicopter School. Below, an *M48* tank climbs out of a gully during training at Fort Hood, Texas, home of the 2d Armored (Hell on Wheels) Division.

Fort Hood has trained the 1st, 2d, and 4th Armored Divisions since World War II. Above left, a tank retriever digs in during tank recovery training. Above right, trainees learn how to overcome obstacles as a part of the Physical Training Confidence Course. Below, an *M48* tank being taken over the driving course during training at Fort Hood.



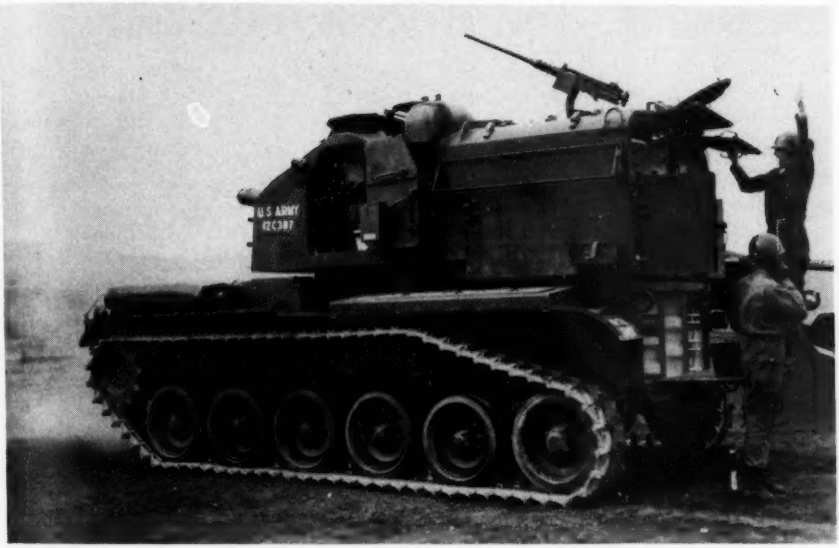
Above, soldiers from Denmark are shown receiving instruction on the *Nike Ajax* supersonic antiaircraft guided missile at the US Army Air Defense School at Fort Bliss, Texas. Below left, Danish soldiers are being instructed on the target-tracking radar of the *Nike* system. On the right below, is a US Army *Corporal* Guided Missile Radar Unit.





4.2 mortar in firing position

M16 with crew



105-mm *M52* howitzer (self-propelled)

155-mm howitzer *M1A2* with tube of 155-mm gun *M2* on the right

155-mm gun during a massed artillery fire demonstration

280-mm gun is shown an instant after firing with the crew at right

LIMITED DEFENSE IS NOT ENOUGH

Colonel Bennett L. Jackson, *Infantry*
Joint United States Military Advisory Group, Thailand

THERE have been periods of tension in the world when shifting power relationships made it difficult for a nation to identify its enemies. If the Russians have done nothing else, they have spared us any uncertainty on this score. When Mr. Khrushchev blurts out, "We will bury you," he is expressing an intention so deeply rooted that it cannot be brushed aside. In this sense, it was the Soviets who authored the North Atlantic Treaty, and NATO's defenses are directed at the threats from this one source.

NATO has been subjected to a full measure of cold war, cajolery, and blackmail. Still the principal threat it faces is that of war.

It is axiomatic that general war can be started as an irrational act. When the power of that act rests with a government capable of the savagery demonstrated in Hungary, such a possibility must be considered as ever-present.

The time may even come when general war can issue as a reasoned act. It has been stated that the present atomic stalemate rests chiefly on the bases of symmetry in offensive and defensive capabilities and in the relative vulnerability of targets. If the dynamics of technology upsets this balance, then the atomic stalemate is broken. To reduce this to concrete terms, it would appear that if the Soviets could perfect their missiles within the timeframe which caught NATO's retaliatory forces dependent upon a vulnerable base complex, they might then feel that the launching of an all-out nuclear war was worth the gamble. At the same time, however, the Soviets would have to perfect their air defenses to a degree of effectiveness calculated to deal with such of NATO's delivery means that were air or seaborne at the time of the attack.

Nuclear Exchange Undesirable

If the NATO members and the Soviets agree on anything, however, it is that a thermonuclear exchange is the least desirable of all wars. Even if the Soviets were to gain a margin of technological advance sufficient to give them a calculable advantage; they would probably—as an alternative to thermonuclear war—prefer to use the advantage as a leverage to support aggression by less dangerous means; in other words, by limited war. The prize would be all of western Europe, or, alternatively, a progression of *coups d'etat* starting, perhaps, with the seizure of control of the outlet of the Baltic or the Black Sea.

NATO does have the option of refusing to accept limited war. Indeed, unless it can be shown that limited war is to NATO's advantage, it has no other choice.

In recent years the world has experienced limited wars in Korea and Indochina. No one may be happy with the consequences of these wars, but all are agreed that the accepted outcome was preferable to all-out war. This lends support

Although the principal mission of NATO is defense of member nations, if attacked, this defense must not be limited in scope but conducted aggressively and in an unlimited fashion, militarily and politically

to a syllogism which runs something like this:

Major premise:	Total war is unthinkable.
Minor premise:	Limited war is the alternative to total war.
Conclusion:	Only limited wars will be fought in the future.

Unfortunately, the situation is not quite this simple. Of the some 80 nation states in the world capable of the sovereign act of war, only two can, at present, project the kind of total war that is "unthinkable." What might be limited war for the great powers could very well be total war for some lesser nation. It is only when there are prospects that such a war will bring the Soviets into collision with the United States that the war is returned to the "unthinkable" category.

Most obscure of all is just how a coalition can accommodate to limited war when one or more of its members is critically involved in the action. If the Soviets attempt by war to detach some vital holdings of a NATO member, that war could well be a total one for the individual nation. However, the Soviets may wish to make such a war appear to be limited insofar as the coalition is concerned. It would become the total war in the "unthinkable" category only if NATO has the will and determination to make it so. Since deterrence rests ultimately upon total war, it would seem that NATO must be willing to accept that kind of risk, if it is to maintain the peace.

Colonel Bennett L. Jackson was graduated from the University of Maryland; the Advanced Officers' Course, The Infantry School; the U. S. Army War College; and the Associate and Special Weapons Courses of the U. S. Army Command and General Staff College. During World War II he served as company commander, regimental S3, battalion executive, and battalion commander of the 14th Infantry. From 1945 to 1948 he served as personnel staff officer, United States Forces European Theater, and from 1948 to 1950 he held the same assignment with Headquarters, First Army. Other assignments include staff officer, Foreign Military Rights Negotiation Section, European Command, 1952-53, and staff officer, Office of the Deputy Chief of Staff for Personnel, and Office of the Deputy Chief of Staff for Reserve Components, 1953-57. Colonel Jackson presently is serving with the Joint Military Advisory Group, Thailand.

Local Defense

One would hope to be able to elaborate for NATO a sophisticated strategy which, failing deterrence, would ensure the war being fought out by limited means. There are theorists who believe that this can be done. Dr. Henry A. Kissinger is one of them. He considers that NATO should espouse a strategy of local defense, making it effective through the use of nuclear weapons.

One can agree with Dr. Kissinger that an adequate local defense is desirable for NATO. Certainly, NATO's local defenses must be strengthened. It is not likely, however, that, given its own best efforts and liberal US aid, its defenses can be made strong enough to defeat the Soviets in limited war.

The limited wars of the recent past have found the protagonists fighting in areas that were not the homeland of either. National survival was patently not at stake. If it could be arranged for the NATO forces to fight the Soviets for less than vital issues and on territory not owned by either, the proposition of limited war could be made as feasible as it would be senseless.

The NATO defensive role allows the enemy to carry the war to NATO's homeland. Thus a large part of the national territory is engulfed in the battlefield in a very short time. The battlefield thus embraces the significant friendly strategic targets and none of the enemy's. In a limited war situation, all or most of the nuclear rounds both friendly and enemy

would be absorbed on the very territory NATO is pledged to defend. The outcome of such a battle is not difficult to forecast. Even if the Soviet army in the field were destroyed, the Soviet homeland would be untouched and a second attack could be mounted with an overwhelming advantage.

If there is any determination to defeat other than minor Soviet aggression, there can be no acceptance of such gross disadvantage in the target arrays which are to be considered vulnerable.

Political Objectives

It is a tenet which appears to have the acceptance of all theorists of limited war that the adversary must not threaten the survival of his enemy, not demand unconditional surrender. Robert Osgood goes so far as to say that the political objectives of a limited war must be susceptible to accommodation.

In this sense, then, there can be no real limited war for NATO. The act of aggression evidenced by a Soviet attack automatically would threaten one or more of the NATO nations under conditions which would make it appear that survival was at stake. What presumably could be considered a matter for accommodation by the alliance would be a vital issue for the individual member nation affected. The threatened nations have only the choice of accepting defeat or of ejecting the enemy by whatever means are available to them. NATO has much the same choice. NATO cannot make an accommodation affecting vital issues pertaining to one of its members without destroying itself.

NATO can either permit the Soviets a relatively cheap victory by agreeing to confine the war to a locale embracing its own strategic targets, but not those of the enemy; or it can carry the war to the Soviet homeland, if necessary. If the alliance has the meaning its members have a right to expect of it, the choice will be that of resisting by all means available.

It is a fact today that the United States is the only nation in the world with the miltary power capable of checking the Soviets. If the full protection of that power is not afforded her allies, then the pact will have lost its principal powers of deterrence, and the United States is courting disaster for herself as well as for the allies.

If the war of limited means is grossly disadvantageous to NATO from a military viewpoint, it is unthinkable in its political aspects.

Here one needs to go back to fundamentals. The key is in Article 5 of the treaty. It says, in part: "The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all. . . ."

Moral and Legal Obligations

Whatever else may enter into formulation of US foreign policy, regard for legal and moral proprieties, more often than not, plays a part. This has not always been profitable as policy. In NATO, however, our own best interests and the ethics of our highest aspirations are met in happy combination. We have a clear legal obligation to come to the aid of any NATO nation under attack. Our moral obligation is no less clear. These legal and moral obligations serve our own best interests. Determination to defend NATO, by all available means, strengthens the deterrence value of the alliance, and it must be remembered that this is the first aim of NATO. It also provides the best safeguard for NATO if deterrence should fail.

It smacks of cynicism to say—as the academicians have done—that limited wars may be joined only over nonvital issues; and, at the same time, advocate limited war for the NATO alliance under conditions where issues vital to member nations are very much at stake. The NATO nations must stand or fall together. This

is not to equate the smallest member nation with the most significant. It is to contend, however, that if any member's vital interests are sacrificed, the military position of the alliance has been breached; and, more important, a spiritual defeat has been accepted—a defeat which may well signal the loss of the entire free world.

The proponents of a limited war for European NATO should give some thought to the effects of a limited war on the North American Continent, which the parties of the treaty also are pledged to defend. Let us hypothesize a Soviet attack aimed at Alaska, British Columbia, and the United States Pacific Northwest. Could the US afford to keep the war limited? What would be the effect of, for example —in keeping with the advice of limited war theorists for making the limitations explicit—our saying to the Soviets, "In order to keep the war limited, we agree not to bomb targets in Soviet Europe if you refrain from attacking targets more than five hundred miles inland"? The Soviets would no doubt be happy to have the limits of their first phase of the war so happily circumscribed.

To elaborate for NATO a war of limited means is to abrogate the essentials of the treaty. In a wider sense, of course, any NATO war is limited. NATO has set the bounds, which is its own defense. It seeks only to defeat aggression, but this it must do with all the resources at its command.

Conclusion

To say that the principle of limited war is not appropriate for NATO is not to say that every aggression must be met by a general thermonuclear strike. There is no war at all unless the Soviets attack. If the Soviets do attack and the aggression proves abortive, the resulting action will have the appearance of limited war. NATO, being interested only in its own defense, should use only the force necessary to repel the aggression. What NATO should not do is to accept limitations and restraints which would impair its defense. What is needed is for NATO to say to the Soviets:

We will defend our territorial integrity with all our resources. If patrols violate our borders, we will drive them off with small arms; if a company attacks, we may use artillery; if a division strikes we may employ nuclear weapons. If any army marches against us, we will strike along the lines of advance, going as deeply as necessary to halt it.

This is all-out defense. It provides for a graduated application of force, but it is based on all-out, not graduated, deterrence.

It can be said of all-out defense that it has the best chance of deterring aggression; it also provides the best answer to aggression if it does come.

Although a modern Army division employs machines as marvelous as any envisioned by 'men from Mars,' this instrument of military force is still *controllable and selective.*

It need not annihilate in order to liberate. It need not invite mutual extermination in order to defend. It can halt at a national boundary or at a city limit if necessary. It can distinguish friend from foe—the enemy soldier from his innocent child. It can heed the warning of a prophetic genius—Stephen Vincent Benet: it can cut down the weeds, yet 'leave the grain standing in the field.'

General Willard G. Wyman, Retired

Aerial Vehicles in the Ground Role

Colonel Jay D. Vanderpool, *Artillery*
Director, Combat Developments Office, U. S. Army Aviation School

THE United States Army has the potential ability of successfully meeting any possible enemy army.

The United States Army possesses firepower previously never available to any ground force and is backed up by history's greatest logistics base. The Army is supported by a people devoted to high ideological goals and contains leaders of all ranks who have been highly trained and combat tested.

However, although revolutionary advances have been made in firepower potential, battlefield mobility has progressed slowly through evolutionary stages. This has resulted in an undesirable imbalance between the two.

Throughout military history the balance or imbalance between firepower, mobility, and logistics has dictated tactics. Genghis and Kublai Khan exploited the mobility provided by the Mongol pony to dominate most of the known world. The Mongol hordes determined the course of hundreds of battles and affected the history of the world for centuries. Only fuel problems in the form of grass slowed them.

Weaponry destroyed the armed and armored knight of medieval battle. The firepower of the crossbow and gunpowder overcame mobility and armor. The knight in his armor and castle disappeared from the scene. The classic battles of the War Between the States illustrate the eternal firepower-mobility-logistic struggle and need not be enumerated to any student of military history.

Firepower, in the form of automatic weapons and artillery, exceeded mobility in World War I to a degree that millions of soldiers faced one another for several years without material tactical success. National attrition, or logistics, finally decided the battle. Vehicular mobility and armor were introduced during this war but not in sufficient quantities to threaten firepower superiority seriously.

By World War II the pendulum had swung again. Mobility had attained an equality with firepower, mobility in the form of airborne and naval columns, armored and motorized forces. The airborne forces moved at great speed through the air but were reduced to a couple of miles per hour on the ground once they were clear of their vehicle. Naval columns advanced upon the landing sites at speeds between 10 and 20 knots. Ashore, the troops moved at two miles per hour again. Armored and motorized columns probably best exemplified tactical mobility with their ability to maintain momentum to the extent that logistics and terrain would permit. German armored columns exploited the immobility of the Maginot Line. Allied armored columns drove deep into a logistically weak German Army. The Allies won by a combination of superior mobility and logistics; firepower of the forces being roughly equivalent.

Near the end of World War II, the United States forces introduced a new weapon, the nuclear device. The atomic/hydrogen family of warheads gave fire-

An aerial vehicle designed for speed and altitudes compatible with Army requirements and provided with appropriate armament will provide ground units the increased mobility needed on future battlefields

power an immediate supremacy over mobility. This weapon provides a comparable imbalance to that introduced by gunpowder in its day. The introduction of better electronic equipment for electromagnetic reconnaissance and control; the advancement in antiarmor weapons; the rocket and missile development; and improved range, accuracy, and lethality of conventional weapons promises to outstrip mobility, with or without the employment of nuclear weapons.

Great firepower without mobility predetermines battles of attrition. Battles of attrition force opponents to continue slugging until the damage and destruction, by one or the other, exceeds the ideological and political advantage of continuing the struggle. Firepower between major armies today again is roughly equivalent.

Mobility Must Be Reasserted

How are we to obtain a favorable mobility differential? An immediate answer, with equipment available today, was provided by General Willard G. Wyman, in his concept of mobile task forces. This concept provides that each divisional commander have trained and ready to move at a moment's notice, a battle group or regimental-size unit completely mechanized and ready to fight on a coded signal from the commander. Regiments or battle groups have a comparable smaller organization within their equipment limitations. In effect, the mobile forces concept is an interim measure which brings current organizations into consonance with conditions upon the modern battlefield. As vehicles and weapons improve, qualitatively and quantitatively, tactical organizations will progress through evolution into mobile forces.

Improved, workable organizational, vehicular, and weapon concepts must continue to be developed. Through constant research, experimentation, and testing we will arrive at improved concepts—not by waiting until an optimum balance of firepower, mobility, logistics, and organization are delivered in a package.

The mechanized solution to mobility has been sought by nations of the world for the first half of this century. Billions of dollars, pounds, rubles, and francs have been expended in the search for improved mobility of surface vehicles. The people of the United States spend over 20 billion dollars a year for new automotive equipment for their personal use. This expenditure still does not provide the mobility desired. Additional billions are needed to provide narrow strips of asphalt or concrete between population centers and the surrounding resources.

A combination of wheeled vehicles and highways provides a form of mobility. Railroad trains combined with ribbons of track again provide mobility. Barges and ships following rivers and canals provide suitable mobility for some industrial requirements. The fact remains that after 50 years of worldwide research and development, surface mobility is predetermined largely by the location and routes of highways, railroad tracks, or waterways.

Similar limitations and capabilities are found in civilian and military vehicles. The tank and the tracked engineer vehicle have relatively good flotation characteristics but, due to their inherent weight and limited power, they are subject to bridge limitations, slope gradient problems, stream and swamp obstacles, as well as range limitations. The commercial or military truck can employ additional wheels to improve flotation but a point of decreas-

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Colonel Jay D. Vanderpool served during World War II as Division G2 and G4, 25th Division; theater staff officer, Far East Command; and as commander of the 337th Field Artillery Battalion. He also served as a guerrilla fighter on Luzon during World War II, and as a partisan (guerrilla) commander during the Korean conflict. Colonel Vanderpool presently is Director of the Combat Developments Office, U. S. Army Aviation School, Fort Rucker, Alabama.

ing returns is reached eventually. Very low ground pressure tires, or rollagon type devices, offer considerable promise for cross-country trafficability as these will be able to overcome former barriers of rough terrain, marshes, and eventually streams, but their projected speed is not great.

The characteristic common to all ground vehicles, however, is that each can be designed for relatively high speeds for movement along natural or prepared, hard

The *H-19*

surfaces, but once these are abandoned, speeds are reduced to an average of 10 or 15 miles per hour or less.

Within the present state of our scientific, industrial, and military knowledge, must be solved the present and growing imbalance between Army firepower and mobility. The United States Navy can select from surface, underwater, and aerial vehicles. The United States Air Force operates above the earth's surface to what will soon be almost unlimited altitudes. The Army's alternates are improved surface mobility or some type of aerial vehicle.

The Aerial Vehicle

Aircraft have been available for approximately the same number of years as the motorized vehicle. Why haven't they been exploited in the ground warfare role? Let us consider some of the reasons. When the Army seriously entered the aviation field in World War I, two outstanding factors immediately became apparent, one positive and one negative. First, the aircraft introduced a new method of rapidly delivering destructive devices on the enemy at great ranges and controlled by human intelligence. Second, as the enemy possessed a similar capability, it was necessary to prevent like activities by intercepting him with fighter aircraft.

The relatively small number of aircraft available to the Armed Forces made it imperative that these two areas receive priority attention. Reconnaissance always has been a lesser included function. This necessary emphasis on bombing and intercept dictated the orientation of developmental objectives. As potential enemy bombers flew higher and faster, intercept fighters were developed for greater speeds and altitudes. As enemy intercept aircraft improved, bombers were driven farther aloft and to greater speeds.

Each advancement the Air Force makes to surpass the enemy air arm separates it further in speed and distance from the Army. This is continuing at an accelerated rate. United States Air Force advancement is as essential, of course, to our national security as is that of the Navy and the Army. The resulting development of higher-speed and higher-altitude aircraft creates an increasing vacuum between the speed, distance, and altitude differentials of the Army and Air Force combat elements. The necessary differences in missions have dictated it, not individuals.

The Army Aerial Vehicle

If a mobility differential over possible enemy armies is to be gained, perhaps the potential of the aerial vehicle should be explored seriously.

Some basic characteristics of an aerial vehicle for Army use should be considered. If its mission is to provide increased mobility, the method of attaining this must be analyzed. The tank or motor vehicle can be developed to move at 50, 100, 150 miles per hour or at even greater speeds on smooth, hard surfaces if this is desired. Speed, therefore, is not a primary requirement.

Aircraft and missiles have a potential of flying at altitudes of thousands of feet, or potentially hundreds of miles, but when this is done intimate contact with the ground forces is lost. Great altitude is not a requirement. The Army aerial vehicle must be capable of maintaining an intimate speed and altitude relationship with the ground soldier who uses it. This would have been considered a significant step backward in previous aviation concepts.

Speed is relative. The motorized or armored column has a speed differential in excess of that of a horse column under average terrain conditions. The horse column rate of march exceeds that of the foot column. Military foot movement speeds have not changed materially since Napoleon changed the march cadence. The aerial vehicle applicable to Army use attains its mobility not necessarily by great speeds or altitudes of operation but by the fact that it is not restricted by streams, swamps, logs, vegetation, minefields, rocky terrain, or other incidents and accidents of terrain.

Machines, like people, must live some place. Army aircraft must live with the user. If the user is the infantry company commander, it lives with him as would any other method of transport. The practice of corralling aircraft at a place of their own convenience rather than that of the user cannot be tolerated unless it is also to the user's advantage. The aircraft must be capable of being maintained, or groomed, by the user, if required.

The soldier under fire—whether on foot, or horse, or in a vehicle—always has relied upon terrain irregularities and vegetation for concealment and protection from the enemy. An aerial vehicle compatible with ground warfare must continue to offer this capability. It must be capable of moving slowly and carefully through areas offering concealment to itself and the enemy, then be able to dash across clearings and corridors that expose it to fire. This requires that it be capable of operating not only above the trees but, if necessary, between the trees. It must be able to come to a halt, back up, change course, or spurt ahead. Agility is a fundamental requirement.

The historic combat functions of foot, horse, or mechanized tactical units must be accomplished by the aerial vehicle if it is to provide complete mobility to a balanced military force.

The Helicopter

In the Army inventory we have vehicles capable of being used to develop doctrine, tactics, techniques, and organizational concepts of airmobile forces. The aircraft available today to provide the tactical mobility is the helicopter. It is not an optimum machine for the mission. It is largely by coincidence that the helicopter meets many of the requirements for a tactical force. The military helicopter was designed for reconnaissance, administrative transportation, ambulance service, and aerial logistic support. The inherent helicopter properties of relatively slow speed, its efficiency at lower altitude operations, combined with capabilities of flying in any direction, taking off from and landing on a point, make it a reasonable solution to the Army requirement for increased mobility on the battlefield. With it the Army can divorce ground elements from predetermined highways and terrain suitable for surface vehicles. With this machine we can determine the desired military characteristics of the future aerial vehicle.

While the helicopter, as we know it today, meets many of the requirements of the modern battlefield it has a number of limitations. Some of these are lack of armament and armor; low availability under present systems due to lack of spare parts in the field; high fuel consumption in comparison to fixed wing aircraft; and high production cost per pound of aircraft or lift capacity. Additionally, for reasons not

completely clear, many militarily trained individuals consider it to be highly vulnerable to enemy action. To further complicate the employment of the helicopter, an aura of romantic mystery surrounds it as it did the Napoleonic artillery. This has not been to the benefit of ground combat forces.

Armament

The problem of a lack of armament is not a difficult one. An experimental team at the U. S. Army Aviation School in

The *H-13*

conjunction with Army Ordnance and industry, developed a series of experimental weapons systems for helicopters. These included fixed, flexible, and remotely controlled weapons for the helicopter. Weapons tested to date include caliber .30, 7.62-mm, and caliber .50 and 20-mm machineguns as well as rockets varying between 1.5 inches and 3.5 inches. The feasibility and practicality of providing the helicopter with a variety of weapons systems has been accepted by the Commanding General, US CONARC. Statements for new matériel requirements for helicopter armament systems are being processed. Further investigations are being conducted to determine optimum systems for the helicopter.

Armor

Armor protection for any aircraft is a function of available horsepower, lift capabilities, and a weight penalty compromise. The reconnaissance helicopter today is as readily converted into an armored vehicle as was the *Model T*. The power available just hasn't been exploited. The introducton of gas turbine engines, with a reserve of power, in our newer aircraft provides an opportunity to add light protective armor for defense of aircraft, crew, and passengers against small arms and fragments. Additional armor is simply a function of horsepower and acceptable payload penalties.

Reliability of component aircraft parts is improving as we gain experience. The new family of turbine engines promises much greater periods of operation between inspections, major overhaul, or component replacement. Aircraft are being designed for greater ease of component replacement in the field. Major unit parts can be repaired in rear areas. Reliability of equipment, rather than simplicity of design, is indicated as the objective. This principle has been proved in the automotive industry. For example, the automatic transmission is a highly complex component but it provides reliability and long life.

Fuel Consumption

Helicopter fuel consumption is a difficult problem. The helicopter lifts itself by brute force. Energy in the helicopter is nothing more than converted petroleum products. Energy required to move the aircraft in a direction and at a speed desired by its operator requires fuel expenditures. The efficiency of the helicopter rotor system has limitations. The rotor must not only lift the vehicle but also provide propulsion in the selected direction. Some methods of partially unloading the rotor in flight and providing auxiliary propulsion are indicated clearly. Several systems have been tested and proved to be feasible solutions to this problem but they are not yet available in the Army inventory of operational aircraft. The ultimate vehicle may not be a helicopter at all, but it will have many of its characteristics. Until advanced and proved principles of

aerodynamics and propulsion are adopted, the helicopter must be used.

Vulnerability

The vulnerability of the helicopter warrants a complete study in itself. The "Shoot Down the Helicopter Club" destroys them on sight with an air rifle. The "Helicopters Can Do Anything Club" advocates charging into battle where a *Joseph Stalin X* tank would fear to tread. Somewhere in between is probably more realistic. Of course the helicopter is vulnerable. The assault soldier in an OD shirt protecting his chest is vulnerable; the truck is vulnerable; the armored personnel carrier is vulnerable as are the tank and the multi-Mach speed aircraft. Vulnerability, like mobility, is relative. If the helicopter or similar machine attacks under a situation of the enemy's choosing, he probably will be shot down as he should be. Cavalry charges against direct fire weapons and artillery have not been notably successful. World War I massed infantry battalion assaults against machinegun battalions were discouraging.

In any event, if aerial vehicles are employed with the ground forces in warfare, some of them will be destroyed. Other vehicles will be, why not these? In the history of war there is nothing unusual in the idea that a soldier's mount will be shot from under him or that he will be shot. The helicopter is not inherently more susceptible to damage from the impact of an enemy munitions than is a fixed-wing aircraft in the same weight category.

Logistics Summary

Logistic considerations of the aircraft used in ground operations may include initial cost, fuel consumption per mile or hour of operation, reliability, mechanical life expectancy, range endurance, and probably vulnerability to enemy action. Maintenance hours requirements should be deemphasized since the helicopter already has an availability factor equal to the tank or armored personnel carrier. With a parts supply system that is responsive to the user, the helicopter easily can attain the availability rate of the truck and jeep.

Costs

We must explore the logistic advantages and liabilities of an aerial machine in the ground role. Let us consider the helicopter as an example. We are most familiar with it even though it was not designed specifically for the mission considered.

Initial costs of a helicopter—or another machine fulfilling the requirements enumerated—are expensive, partially due to limited production. On the other hand, how much would your automobile cost if it were handmade in limited numbers? Production in quantity will reduce the cost. Requirements increase production and thereby reduce unit costs.

Availability has been low and is based upon several factors. The primary one is a supply system geared to the automotive, locomotive, and river barge tempo. Another may be considered as a lack of reliability of component parts of the machine. The new turbine engines will be rated at 1,000 hours before the Army has a full complement of turbine-powered aircraft. By the time the Army can fully integrate the aerial vehicle its reliability should compete with or exceed the jeep or truck.

Aerial vehicle fuel consumption *per hour of operation* will probably never equal the ground vehicle. However, fuel consumption *per mile of operation* of the aerial vehicle is better than that of armored vehicles today. With concentration and development in this area, this can be improved.

Past and Future

The United States with her Allies won World War I by attrition or logistic supremacy. The United States and her Allies won World War II by mobility and logistics. The Korean incident was resolved on geopolitical decisions rather than mil-

itary ones. Even so, the campaigns in Korea sharply emphasized the requirement to reestablish mobility on the battlefield. The Chinese-Korean forces employed masses of manpower. The United Nation forces emphasized firepower and logistics. Except for the end-run into Inchon Harbor, the United States forces demonstrated a remarkable lack of mobility. This end-run mobility capability was provided by the United States Navy, not the United Nations Army. The United Nations Air Force

The *H-21*

had its hands full repressing enemy air cornered in the north. This, plus their essential interdiction missions, kept them occupied. The speed of advance to the Yalu River was variable and was confined to predetermined avenues of vehicular approach.

The retrograde movement from the Yalu along the same routes to Wonsan and other evacuation ports, with its painful losses of proud units, reemphasizes where the United States Army was sorely lacking in tactical mobility.

Lieutenant General James M. Gavin pointed out in his article of June 1954 in the *Armed Forces Journal* the necessity of developing a greater mobility in our Army. His article, entitled "Cavalry and I Don't Mean Horses," emphasized the capabilities of aerial vehicles, in this case helicopters, to replace the historic role of our cavalry forces in battle. A few companies of helicopter cavalry could have prevented, or reduced, the embarrassingly consistent Chinese envelopments of our forces. With an additional capability of firepower, this small force might have reduced the enthusiasm of the Chinese Communist volunteers.

If we found that our Army mobility was inadequate for a minor war, without the play of atomic devices, then it may be presumed that our capabilities in major war without atomic license would be even more difficult. If these assumptions are correct and Army mobility remains as it is today, then a major war in which both protagonists were entitled, by the nature of the conflict, to employ nuclear methods of destruction, might result in the United States Army and the Nation being historically embarrassed.

The United States Navy can, with national support, dominate the seas on the surface, underwater, and above their fleets. The United States Air Force can dominate the upper reaches of our airspace and deliver fire at great distances. The Army still has the responsibility of taking, denying, and defending the ground.

Conclusion

The pendulum has swung. We have acquired great firepower in both conventional and nuclear weapons. Our national resources represent a vast logistic potential. Tactical mobility must be brought into balance with firepower and logistics. The surface vehicle has not met this challenge. The lower spectrum of airspace must be exploited. An aerial vehicle designed for speeds and altitudes of operations compatible with Army requirements and provided with appropriate armament and armor can restore our mobility differential. The United States possesses the scientific and industrial knowledge and the resources to do this. The requirement is urgent. It must be accomplished.

Combat Surveillance

Lieutenant Colonel Irving Heymont, *Infantry*
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THE availability of long-range means for delivering nuclear fires has created many problems, particularly in the fields of intelligence and operations. The ability to locate and identify targets deep in enemy rear areas has lagged behind the development of weapons with ever-increasing ranges. New tactical concepts, designed to cope with the tremendous destructive power of nuclear fires, further complicate acquisition of intelligence.

The increased width and depth of the atomic battlefield, sparsely populated in depth by units rapidly concentrating and dispersing, require added effort to locate and identify enemy forces. Operations, which are essentially the close integration of fire and maneuver, depend, in part, on the ability to determine the effectiveness of nuclear fires. This poses the requirement for a capability to determine quickly the ground zero, height of burst, and yield of all nuclear fires delivered by either opposing force.

To focus attention on these problems and to guide research and development agencies, the US Army has developed the term combat surveillance. Combat surveillance is defined and explained in Field Manual 100-1, *Field Service Regulations; Doctrinal Guidance*, as follows:

Combat surveillance is a continuous, all weather, day and night, systematic watch over the battle area to provide the commander timely information for tactical operations. The Army's combat surveillance system is the aggregate of all technical and nontechnical means required for collecting, processing, and disseminating information concerning both friendly and enemy forces and activities, weather, and terrain, that can influence ground combat.

This definition and explanation is so broad that it loses meaning. It can be justifiably interpreted to include all the activities of a tactical command. The use of radar to locate an enemy force and the use of a status of equipment report to ascertain the number of operational tanks can both be included under combat surveillance. Both represent means for collecting information of friendly and enemy forces capable of influencing ground combat. Of course, this is ridiculous, yet both follow logically from the current official definition and explanation of combat surveillance. Confusion is inevitable when a shovel is defined as earth-moving equipment.

In practice, the term combat surveillance is used generally in referring to sensory and mechanical devices for securing information of the enemy, the area of operations, the location and movements of friendly units, and for the recording, collation, display, and dissemination of the collected information. However, even this informal limitation of the meaning of the term combat surveillance is not sufficiently definitive and results in confusion.

The problem of increasing our ability to locate targets for our advanced weaponry is urgent and must be defined clearly now, if we are to close the gap between weapons design and intelligence capabilities

Major Problems

The major problems within the usual usage of the term combat surveillance are:

1. *Extending the effective depth and scope of the intelligence collection effort of each command to at least the range capabilities of its available weapons systems.*

2. *Improving means of making the collected information and resulting intelligence available to the users faster and in more useful form.*

3. *Providing a fast and reliable capability to determine height of burst, ground zero, and yield of all detonated nuclear weapons, particularly with respect to surface bursts.*

These are three distinct problems. The solution to one does not solve the other two.

Various sensory devices, including ground and airborne radar and infrared, have been developed or are under development to improve and extend the depth of the intelligence information collection effort. These devices are primarily for gathering information of the enemy and the area of operations. Pending development of effective identification devices that distinguish friend from foe, information obtained on the locations and movements of friendly units should be confirmed by other means.

The second problem basically is the improvement of present procedures and techniques for recording, collation, and dissemination. Closely allied with this problem are the mechanical means of integrating intelligence information with operational information in order to facilitate operational planning and decision making. In effect, this is a joint intelligence and operations problem which would require solution even if nuclear fires and long-range delivery means were not available. Too often in the past, essential information was available but neither recorded, collated, or disseminated in time to be of use.

The use of automatic data processing systems offers a possible solution to this problem without reference to the problem of extending the effective depth of the intelligence information collection effort. However, the solution to this second problem must consider the type and volume of intelligence information resulting from the solution to the first problem.

Within the next few years, devices that help solve the first two problems do not have any direct application in solving the third problem. The problem of how to secure the necessary data for post-strike damage assessment requires a different solution.

Lumping all three problems under one very broad term is misleading. A more meaningful definition of combat surveillance is:

Combat surveillance is that part of the intelligence information collection effort concerned with the continuous (all weather, day and night) systematic watch over the battle area to provide timely information for tactical ground operations.

On the basis of this new definition the broad implications of combat surveillance

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can be examined with a clear understanding of the precise problem involved.

Combat Surveillance and Targets

Target acquisition is that part of combat intelligence which involves the collection and verification of information on an enemy force, activity, or installation that can be taken effectively under fire. It includes the detection, identification, and determination of target locations, either ground or air. Target evaluation, on the other hand, is an estimate process that enables the commander and his staff to determine relative target importance, reach a decision as to suitability and efficiency of available nuclear or nonnuclear fires, and establish a priority of attack.

Combat surveillance, as part of the collection phase of the intelligence cycle, makes significant contributions to target acquisition by furnishing the basic information required for the detailed target analyses which are part of target evaluation. Combat surveillance, however, is not in itself adequate for target acquisition. A knowledge of the characteristics of the area of operations, order of battle, enemy weapons, habits, and personalities is essential to determine where combat surveillance should be concentrated to best support the target acquisition effort and to interpret the resulting information.

Information from combat surveillance also is vital in the determination of enemy capabilities and vulnerabilities. Often it will not be possible to determine at first glance if an item of information assists in either target acquisition or in determining enemy capabilities and vulnerabilities.

Usually, combat surveillance information must be integrated with information and intelligence produced by other means in order to derive its significance. Consequently, to be of maximum value to the commander and staff, all raw information from combat surveillance must flow from subordinate units to the intelligence officer of the command and not only to fire support coordinating agencies. Of course, the intelligence officer must ensure that the fire support coordinating agency has immediate access to pertinent information. Equipment and organization must be such to permit this prompt dissemination. Automatic data processing systems and the operations center concept of staff organization are promising developments in this field.

Surveillance Areas

To determine the desired characteristics of combat surveillance devices and to assign properly devices now in existence, the area of direct concern to each command level must be established. The area of direct concern to a commander extends ahead of his force to at least the maximum effective range of the fire support means available to him. This area will be called the *area of influence*. Specifically, it is that part of any commander's area wherein he is capable of directly influencing combat operations by maneuver or by the delivery of firepower with the weapons under his control.

The following are approximate depths of areas of influence for the commands indicated:

Battle group (combat command)	5—15 miles
Division	15 miles
Corps	50—75 miles
Army	200 miles

To plan for employment and security of his force, a commander requires intelligence at distances greater than the area of influence. This additional area, which will be called the *area of interest*, extends beyond the area of influence to include the final objective of the current operation as derived from the mission of the next higher commander. For an interior force, the area of interest extends laterally into the zones of adjacent commands to include the areas occupied by those enemy ground forces which can materially affect the accomplishment of the assigned mission.

Means and Employment

No one combat surveillance device or system is complete in itself. Combat surveillance means are employed and integrated to help provide a composite of the data collected by all other means. Combat surveillance devices available now, or in the near future, include all-weather ground radars employing moving target indicators, and improved Army aircraft, including drones, capable of carrying efficient sensory systems such as aerial cameras and radar and infrared detectors. These devices will extend the commander's knowledge of the enemy, characteristics of the area of operations, location of forces, and will permit him to employ his maneuver units and firepower more effectively.

However, the effectiveness of all these devices cannot be exploited fully unless they are integrated properly within the command. Except as limited by maintenance and operational requirements, combat surveillance devices in support of any given command should be in one unit which is directly responsive to the commander concerned. Combat surveillance is better coordinated, controlled, and supervised when the devices are under a single commander directly responsive to the needs of the command. This also facilitates the coordination of similar activities with higher, lower, and adjacent units, and the support of task forces.

Because of control of air space and maintenance requirements, all airborne combat surveillance equipment, including drones, *should* be included within the aviation unit of the command. The unit aviation officer determines which equipment will be used to fulfill the collection tasks assigned by the intelligence officer through the G2 Air. The intelligence officer and the G2 Air, in carrying out the collection plan, make full use of the capabilities of the airborne surveillance equipment in the aviation unit. Ground-based surveillance devices used to support the unit as a whole should be under the operational control of the intelligence officer. Whether the ground surveillance unit is a separate company or a platoon in a headquarters company will depend on the size of the unit.

The current divisional organization for combat surveillance is faulty as all the principal combat surveillance devices are assigned to a reconnaissance and surveillance platoon in the division reconnaissance unit. The aircraft for the airborne combat surveillance equipment are assigned to the division aviation company. In some respects this is comparable to assigning howitzers to an artillery unit and the prime movers to a transportation corps unit. Often the mission assigned to the division reconnaissance unit is not compatible with the desired employment of the combat surveillance devices to support the entire division.

It is not unrealistic for the reconnaissance unit commander to use the reconnaissance and surveillance platoon to support the entire reconnaissance unit rather than the entire division. Field Manual 17-35, *Armored Cavalry Units, Armored and Infantry Divisions*, December 1957, indicates such employment. Under the current organization the flow of collection missions and information from and to the intelligence officer and the reconnaissance and surveillance platoon inevitably will be slowed by the processing of the reconnaissance unit staff. Measures to overcome this handicap are outlined below under staff aspects.

Staff Aspects

The close coordination of the intelligence effort and operational requirements ensure that the combat surveillance effort is focused on those areas and possible targets associated with the accomplishment of the mission. Information and intelligence from combat surveillance, as well as other means, must be disseminated in time to the using agencies. The interchange of

information and intelligence among the intelligence officer, the operations officer, and fire support coordinating agencies is particularly vital. Regardless of the origin of the information or intelligence, whether it is from command or fire support channels, it is disseminated to those who require it in time to be of use.

Atomic warfare increases the number and magnitude of activities of common interest to the intelligence and operations staff officers. Combat surveillance is one such activity. The intelligence officer has the general staff responsibility for combat surveillance activities pertaining to furnishing intelligence data. He ensures that the intelligence collection plan considers the capabilities of combat surveillance units and equipment. The operations officer has general staff responsibility for any combat surveillance activities pertaining to the location and activities of friendly forces.

When the desired employment of combat surveillance equipment is incompatible with the mission of the unit to which equipment is assigned, then the combat surveillance unit of the subordinate headquarters may be placed directly under the higher commander's control. This frequently may be the case at division level where most of the combat surveillance devices are now in the reconnaissance and surveillance platoons of the armored cavalry squadrons of the infantry and armored divisions or in the reconnaissance troop of the airborne division. In such instances, these platoons, with supporting aircraft, are placed under direct division control.

The combat surveillance equipment and units of battle groups, combat commands, and artillery units rarely are placed under operational control of the division headquarters since they are provided to assist these subordinate commanders in carrying out their mission. Combat surveillance equipment of battle groups and comparable commands are integrated into the division combat surveillance effort by the assignment of appropriate tasks to the battle group or comparable command.

In using Army aviation for combat surveillance, under present organization, the intelligence officer usually assigns tasks to those subordinate units having Army aviation in support. When it is not desirable to have the subordinate unit secure the required information with their supporting aircraft, then the aviation company through the aviation officer is assigned the task. The information secured by the aviation company is transmitted direct to the intelligence officer through the division radio intelligence net.

Information obtained through combat surveillance must be available to the intelligence officer with the least practicable delay and with minimum processing through intermediate headquarters. To accomplish this, reconnaissance and surveillance units may be directed to report information directly to the intelligence officer. The direct reporting of information usually is limited to specified items.

The intelligence and operations officers coordinate all missions for reconnaissance and surveillance units. When either the intelligence or operations officer generates a mission for a reconnaissance and surveillance unit, the other should be consulted for any items of interest in the area where the mission is to be performed.

Conclusions

The problem of modernizing our ability to find targets for our advanced weaponry is recognized as urgent. Significant advances are being made in the fields of surveillance devices and organizations. However, much more remains to be done before the gap between weapons design and intelligence capabilities finally is closed. In closing the gap it is essential that the problem be defined clearly. If that is not done, much effort and energy will be wasted exploring stray paths that do not lead to the correct objective.

MILITARY NOTES AROUND THE WORLD

UNITED STATES

Lightweight Engine

A lightweight 250-horsepower turbine aircraft engine under development weighs only one-fourth as much as conventional piston engines of the same horsepower. It will be manufactured in two versions: as a prop-jet model of less than 39 inches long and weighing only 106 pounds; and in a 90-pound turbo-shaft version. The Army plans to use the first model in light aircraft and target drones, and the second is intended primarily for helicopters. Both models are expected to find use in a variety of other applications.—News item.

Submarine Killer

A 65 million-dollar contract has been awarded for the development of the *Subroc*, a rocket-powered, antisubmarine missile. The *Subroc* system is designed to detect an enemy submarine at long range, compute its course and speed, and launch the missile. The missile will be propelled through the air by a rocket motor. When the rocket fuel is exhausted the rocket motor is jettisoned, the warhead reenters the water and continues on its guided course to the target. The weapon is planned for launching from a submarine either on or below the surface of the water. —News item.

Aerial Tug

An aerial tug—a helicopter designed to lift and lower a jet aircraft where space is limited—is under study by the Marine Corps as a means of launching its fighter aircraft. The plan calls for a powerful ramjet helicopter to fasten on to a conventional jet aircraft that would ordinarily require a runway of considerable length for takeoff. The helicopter lifts the airplane off the ground and the two aircraft move together until enough speed has been attained so that the plane can be released to fly under its own power. The helicopter has four hollow legs which fit over and grasp fittings on the fuselage of the airplane. The attachment mechanism is controlled by the helicopter pilot. —News item.

Aluminum Personnel Carrier

The Army's new aluminum, air-transportable amphibious personnel carrier, the *T113-E2*, will be smaller and lighter than the present *M59* armored carriers. Preproduction models of the vehicle are now under construction. The new personnel carriers are said to be economical to produce, effective in operation, easy to maintain, and use a minimum of critical material.—News item.

More 'Missile Masters'

Missile Master electronic systems for coordination and direction of *Nike* guided missile firing batteries are to be constructed within Air Force facilities at Lockport, New York, and Highlands, New Jersey. A third installation, to be located at Fort Heath, Massachusetts, will have support facilities at nearby Fort Banks. The first *Missile Master* at Fort Meade, Maryland, became fully operational in December 1957 after almost two years of experimental operation (MR, Feb 1958, p 69).—News item.

Collapsible Helicopter

Several different engines have been used to power the *XRON-1 Rotorcycle*, including a helicopter version of the German Porsche *Type 678* aircraft engine.

US Marine Corps Photograph

One-man *XRON-1 Rotorcycle*

According to *Jane's All The World's Aircraft*, this engine will give the *XRON-1* a service ceiling of 13,000 feet and a speed of about 62 miles an hour. The *Rotorcycle*, which can be collapsed into small packages for easy transportation, utilizes two coaxial, contrarotating rotors. Stability in forward flight is provided by fixed inverted-Vee tail surfaces.—News item.

Replacement for Jeep

Now under procurement for service test as a potential replacement for the present ¼-ton, 4 x 4 jeep in Marine units, the *Mighty Mite* ¼-ton utility vehicle is designed specifically for helicopter transportability. The *Mighty Mite* is 25 inches

US Marine Corps Photograph

Marine Corps *Mighty Mite*

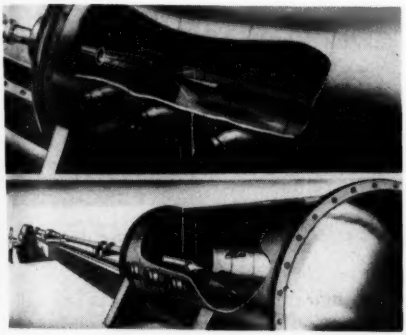
shorter, nine inches lower, and 530 pounds lighter than the Army's new ¼-ton utility truck (MR, Jan 1958, p 68). It can carry a load of 500 pounds cross country or 1,000 pounds on the highway. The vehicle is powered by a four-cylinder, V type, air-cooled engine that consumes one gallon of fuel every 18 miles. Three *Mighty Mites* can be carried in the hold of an *HR2S* Marine assault helicopter.—Official release.

Mobile Test Stations

The Marine Corps is testing specially designed missile test trucks for use in units of battery size, and missile repair vans for use in battalions. The battery test trucks are built on a standard *M-37* ¾-ton truck and contain test equipment for the checkout of *Terrier* missiles under combat conditions. The battalion repair vehicles are constructed on standard 2½-ton *M-109* vans, and are set up to perform troubleshooting and repair of missile components rejected during checkout by the battery test trucks.—News item.

Gun for Research

A gas-driven gun capable of producing speeds up to 13,500 miles an hour for advanced research on ballistic and other high-performance missiles is under construction. The gun may be used either to drive projectiles into test chambers at velocities up to 20,000 feet per second, or to shoot high-pressure, high velocity gas



Stationary model in hypervelocity test (above). Below, a free flight glider model is sabot-launched by research gun

past a stationary model suspended in the test chamber. The facility will consist of a two-stage firing chamber using helium as the driving gas. The helium will be mixed with lesser amounts of hydrogen and oxygen in appropriate combinations, and the mixture is to be electrically ignited.

The barrel of the gun will be 100 feet long and three inches in diameter, and will terminate in two interlinked chambers. The first of these chambers will be a 50-foot blast tank, and the second a 500-foot controlled-pressure range tank. To test a stationary model suspended in the chamber, the barrel of the gun will be loaded with compressed air. The air will be further compressed by the explosive gas mixture and ejected from the muzzle at extremely high speeds.

Models launched at hypersonic speeds into the test tank will be shattered against the chamber walls by the short duration blast. Observation of tests will be made by both optical and electrical means.—Commercial source.

Test by Mirrors

A Navy mirror landing system is in use by the Air Force for testing the landing gear of the *F-102A Delta Dagger* all-weather jet interceptor. In the tests a battery of lights focuses on the mirror surface to provide the pilot with a reference to assure that each landing is on the proper glide path. In using the device, the pilot lines up the concentrated ball of light in the mirror reflection with rows of lights arrayed on each side of the mirror.

***F-102A* in mirror-aided landing**

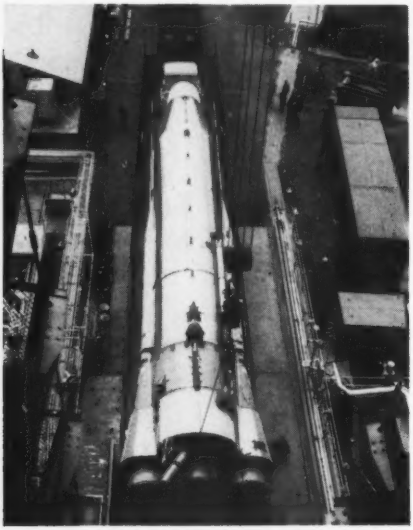
The system was developed for use by Navy pilots in carrier landings.—News item.

'Barbel' Launched

The conventionally powered submarine *Barbel* has been launched. The *Barbel*, which displaces 1,690 tons, is of the improved *Tang* class and has the revolutionary *Albacore* hull (MR, Mar 1957, p 66). Other submersibles of the *Tang* class are the *Darter*, commissioned in 1956; the *Grayback*, launched in 1957; and the *Growler*, *Blueback*, and *Bonefish* which are under construction. The *Grayback* and *Growler* are equipped to launch the surface-to-surface *Regulus* missile (MR, Oct 1957, p 60).—News item.

ICBM Progress

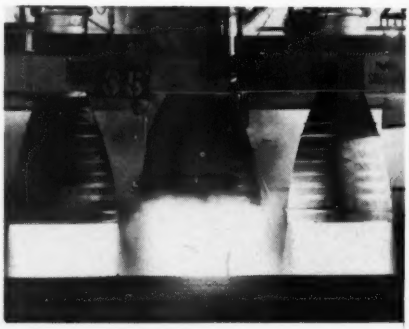
Atlas intercontinental ballistic missiles now are coming off the production line with a full operational power package of three engines instead of the two which previously limited its range to 600 miles in earlier tests. The new series of missiles also will be fitted for the first time with separable nose cones designed to carry nuclear warheads more than 6,000 miles. Principal changes in the *Atlas* are the addition of the third or sustainer engine between the two booster engines; equipment to jettison boosters after the first few minutes of flight; and design which permits the nose cone to be separated from



Atlas **has three engines**

the rocket and continue independently after final engine shutoff.

The *Atlas* has only one fuel tank structure for both booster and sustainer motors. All three of the engines are ignited on the ground, and the sustainer continues to operate after the two booster rockets have been dropped. Directional stability of the missile is maintained by swiveling the large engines of the propulsion system on gimbals. Distortion of the center sustainer motor in the photograph of the group of



Atlas **engines in full-scale test**

engines in operation is due to control gimbaling during a test. At least one full-range flight of the *Atlas* is scheduled for this fall.—News item.

Missile Training

Training facilities for the *Titan*, *Thor*, and *Atlas* ballistic missiles are to be set up at Keesler Air Force Base, Mississippi, Chanute Field, Illinois, and Sheppard Air Force Base, Texas. The Sheppard facilities provide training in the handling of airframes and airborne guidance of the missiles. Training in operation of powerplants and fueling systems is handled at Chanute, and the electronic training facilities are located at Keesler. The Air Force plans to train 4,265 missile men in Fiscal Year 1959 as compared to the 2,235 trained in 1958.

The first Air Force *Jupiter* squadron of approximately 700 men will complete its training by the end of this year, and a second squadron will begin training this fall.

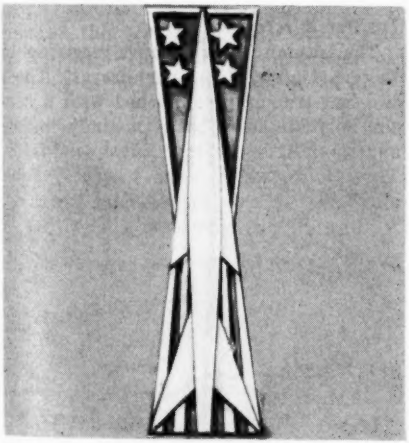
Sixty officers and men of the Italian Air Force have completed their training in maintenance and operation of *Nike Ajax* and *Nike Hercules* surface-to-air

missile systems at the U. S. Army Ordnance Guided Missile School at Redstone Arsenal, Alabama. They are now in a unit training period, the second step toward the formation of Italian missile groups which eventually will be stationed in Italy under the NATO defense program. Similar classes from several other nations are planned for the near future.

The first class of 45 British Royal Air Force and 34 United States Air Force personnel have been graduated from the *Thor* Intermediate Range Ballistic Missile School at Tucson, Arizona.—News item.

Insignia for Missile Men

Personnel of the Air Force missile squadrons will be identified by a small silver badge worn on the left breast pocket of



US Air Force Photograph

Air Force guided missile insignia

the uniform. The insignia depicts a missile rising vertically through a cluster of four small stars.—Official release.

Army Air Defense School

The United States Army Air Defense School at Fort Bliss, Texas, has completed its first year of training allied servicemen on *Nike Ajax* and *Nike Hercules* missiles. Allied students attending the course came from Italy, Saudi Arabia, Norway, Pakistan, West Germany, and Brazil. The allied missile men take the

US Army Photograph

Enlisted men from the West German Army check a *Nike* acquisition radar antenna

same courses as their United States counterparts, but a separate series of courses was set up for each language group to

US Army Photograph

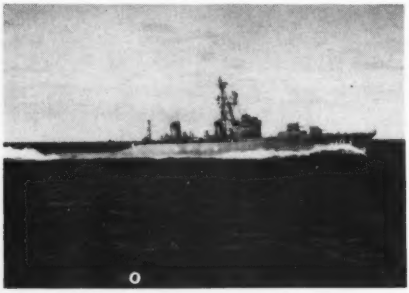
Norwegian students relax and study in a US Air Defense School 12-man dormitory

keep language difficulties to a minimum. Interpreters are provided in the classrooms to help with difficult technical terms.—Official release.

JAPAN

Warship Construction

Construction of the destroyer *Ayanami* and the minesweeper *Kasado* recently has been completed for the Japanese Maritime Self-Defense Force. The *Ayanami*, a *Wave* class vessel, displaces approximately 1,700 tons and has a speed of 23 knots. Armament consists of three-inch guns in three



New destroyer *Ayanami*

dual mounts, two depth charge guns, two hedgehog antisubmarine weapons, and four torpedo tubes in a quadruple mount.

Wooden minesweeper *Kasado*

Other *Wave* class destroyers are the *Isonami*, *Uranami*, and *Shikinami*. The *Kasado* is a wooden minesweeper of 340 tons displacement and a speed of 14 knots.

Two *Rain* class vessels, the *Yuudachi* and *Murasame*, have been launched. These 1,800-ton warships are armed with three 5-inch guns in single mounts, a pair of three-inch guns, and depth charge equipment. They are reported to have a top speed of 30 knots.

The keels have been laid for two destroyers to be built under the 1957 military aid program. The vessels, which will displace 2,350 tons and have a top speed of 32 knots, are planned for completion in 1960. Other vessels scheduled for construction are two more frigates of the *Wave* class, four 450-ton submarine chasers, and four more *Kasado* class minesweepers.

The *Wakaba*, previously named *Nashi* and sunk during World War II, has been raised and reconstructed. It is now fitted out as a radar training frigate.—News item.

IRAN

Trainer Aircraft

The Iranian Government is receiving 15 British *Aiglet J5L* trainer aircraft. These two-seat trainers are finished with a special butyrate dope that is noninflammable and specially suited to tropical conditions. The *Aiglet*, which seats instructor and pilot side by side for primary training, features clipped wings for a high rate of

Aiglet elementary trainer

roll in acrobatics. It is capable of speeds from 29 to 127 miles an hour. Trainers of this type are also in use by the Pakistani Air Force.—News item.

ITALY

Add to Fleet

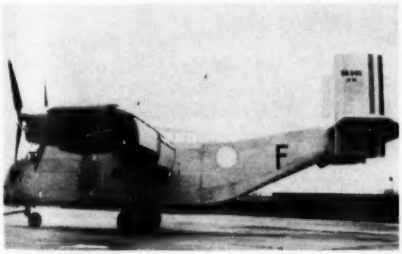
The destroyers *Indomito* and *Impetuoso* are now in service with the Italian Fleet, and a fourth ship of the *Impetuoso* class, the *Intrepido*, has been ordered.

Two 6,000-ton guided missile light cruisers, to be named the *Andrea Doria* and the *Caio Duilio*, are to be constructed. The 9,802-ton cruiser, *Giuseppe Garibaldi*, is being equipped with surface-to-air guided missiles in addition to eight 5-inch, ten 3-inch, and four 57-mm antiaircraft guns.—News item.

FRANCE

Blown-Wing Aircraft

The experimental blown-wing aircraft *Breguet 940* has completed initial trial flights successfully. The high unbraced wing of the *940* is provided with large double flaps. The entire leading edge of the wing is in the slipstream of the four



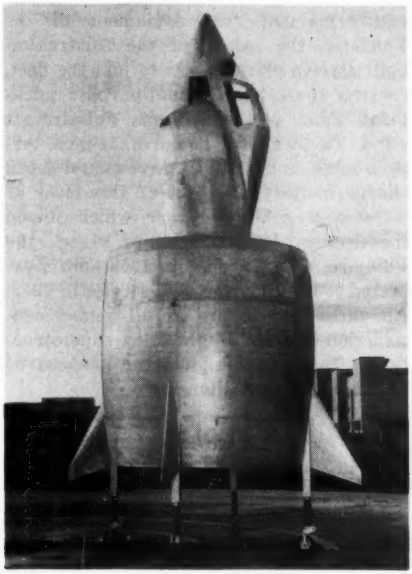
French Embassy Press and Information Division Photograph

Experimental blown-wing *940*

propellers which are driven by four 400-horsepower *Turmo II* jet engines. The propellers are linked by a transverse shaft so that engine failure will not stop any single airscrew. The *940* weighs seven tons and can take off from unprepared fields with a run of only about 360 feet. A future aircraft of this design, the *941*, will weigh 18 tons and will be equipped with four 1,800-horsepower turbines.—Official release.

'Coleopter' Tested

The *Coleopter* is the most recent development in the line of *Atar*-powered vertical takeoff aircraft. Earlier models of this



Latest model of the *Atar* flying engine

aircraft were the *Volant P1*, *P2*, and *P3* (MR, Aug 1957, p 70 and Jul 1958, p 70). In takeoffs and landings the aircraft is supported solely by the force of the jet exhaust.—News item.

AUSTRALIA

Radar Equipment Ordered

Two and one-quarter million dollars worth of the most advanced types of radar equipment will be purchased in the United States for use at the Royal Australia Air Force station at Darwin. Installation of the new equipment, including special types for use with either guided missiles or manned jet aircraft, will make Darwin the third RAAF radar control and reporting unit.—Official release.

Speed Trials

The Royal Australian Navy's newest warship, the *Vendetta*, although officially described as a destroyer, is said to be equal to a light cruiser in performance and armament. The armament of the *Vendetta*, the second of the Australian-built *Daring* class vessels to join the fleet, consists of six 4.4-inch dual-purpose quick-firing guns, and six 40-mm antiaircraft guns. The warship has five 21-inch torpedo tubes, and a *Limbo* three-barrel depth charge mortar. The first of this class of warship was the *Voyager* which joined the fleet in 1957. The third vessel, the *Vampire*, was launched in 1956 and is expected to be ready for fleet service in 1959. All three vessels are of all-welded construction and have light alloy superstructures. They are designed for a speed of 30.5 knots.—News item.

BURMA

Rebels Surrender

More than 1,100 insurgents of the minority Mons racial group have surrendered in a mass ceremony marking the end of a 10-year revolt. The Mons, who ruled lower Burma before the country was unified in the 18th century, had reasserted their independence when the republic was established in 1948.—News item.

POLAND

Atomic Plant Opened

Poland's first nuclear reactor, a Soviet-made research plant with an output capacity of 2,000 kilowatts, has commenced operation. Located in a small town southeast of Warsaw, the plant has been under construction for the past 30 months, and is said to be only about one-fourth as large as the atomic reactor set up in Communist China by the Soviets. Other Soviet-manufactured plants similar to the Polish reactor are operating in Czechoslovakia, Romania, and East Germany.—News item.

ARGENTINA

Aircraft Manufacture

Aircraft manufactured in Argentina include the *IA45* and *IA46*. The *IA45* is a small twin-engine, all-metal transport with pusher propellers. The *IA46* is a single-engine, high-wing monoplane with

The *IA45* (above) and the *IA46* (below)

fabric covering and a nonretractable landing gear.

A high-speed, delta-wing aircraft, the *IA37*, is in development. A glider model with the same size and dimensions as the powered aircraft has been flight tested. The all-wing *IA37* in the powered version will have a turbojet powerplant with 3,600 pounds of thrust and will attain an estimated speed of 500 miles an hour.—News item.

Carrier Purchased

The Argentinian Navy's new aircraft carrier, the *Warrior*, purchased from Great Britain is the fourth British *Colossus* class carrier to be sold to another nation (MR, Sep 1958, p 84). The 14,000-ton *Warrior*, which is insulated for tropical service and partially air conditioned, was modernized recently with an angled deck and improved arresting gear. It is armed with twenty-eight 40-mm antiaircraft guns, has a designed top speed of 25 knots, and can accommodate 50 aircraft.

At one time the *Warrior* was used by Great Britain in experimental operation of jet fighters equipped with skids rather than conventional wheeled landing gear. For this purpose, a temporary flexible deck consisting of a rubber sheet supported by air bags was superimposed on the normal flight deck.—News item.

THE NETHERLANDS

Powerful Fleet

The *Amsterdam*—last of 12 *Type 47* antisubmarine destroyers—has been commissioned, giving the Netherlands the most powerful fleet in her history. Four of the *Type 47* vessels are listed as *Type 47A*, or *Holland* class. They are 10 feet shorter and four knots slower than the other eight, which are listed as *Type 47B* or *Friesland* class. The *Friesland* class warships displace 3,070 tons and have a top speed of 36 knots. All 12 of the *Type 47* vessels are armed with four 4.7-inch guns and two 4-barrel depth charge mortars. The 4.7-inch guns are fully automatic and radar controlled, with a rate of fire of 50 rounds per minute. Beginning in 1960 the afterturrets of all *Type 47* vessels are to be replaced by guided missile equipment.

The Navy's two cruisers, the *De Ruyter* and the *De Zeven Provincien*, are to be equipped with US *Terrier* missiles under the NATO military aid program.

Two of the four *Dolfijn* class submarines previously planned for construction have been canceled. These underseacraft, which displace 1,480 tons when submerged, use electrical propulsion both on the surface and submerged, and have a top speed of 17 knots. Construction of the other two submarines of this class was started in 1954.—News item.

Civil Defense Draft

The Netherlands plans conscription of citizens for civil defense purposes. Persons over 26 years of age will be liable for the draft. According to the announcement, 160,000 men and women have registered for civil defense tasks, but 61,000 more are needed for fire-fighting, medical, and communication duties.—News item.

YUGOSLAVIA

Aircraft Evaluation

It has been reported that two *Folland Gnat* lightweight jet aircraft (MR, Mar 1957, p 68) have been ordered by the Yugoslav Air Force for evaluation purposes. The speedy *Gnat* is already in use by the air forces of India and Finland.—News item.

SWEDEN

Speedy 'Draken'

The *J 35A Draken* double-delta jet interceptor (MR, Apr 1957, p 69), now in production for the Royal Swedish Air Force, will be powered by an 11,000-pound thrust *Avon RM-6* turbojet fitted with a Swedish-developed afterburner. The combination is expected to raise the total thrust of the engine to 15,000 pounds and give the *Draken* a speed of Mach 1.8.—News item.

INDIA

Defense Expenditure

The Indian defense budget approved for Fiscal Year 1958-59 is 2,781 million rupees (584 million dollars). This is about 17 percent of the total of the 14 states' budgets and the national budget combined.—News item.

USSR

Change in Uniform

According to a recent issue of *Air Force* magazine, the Soviet Army and Air Force will wear uniforms of the same color and cut. Details of the uniform are as follows:

Garrison Uniform

Cap.—Olive drab with piping to indicate branch of service.

Blouse.—Single-breasted, open at the throat with soft olive drab shoulder straps and colored collar tabs to mark branch of service.

Trousers.—Dark blue, worn either in or out of boots.

Tie.—Olive drab. *Boots.*—Black.

Field Uniform

Cap.—Olive drab with crown, peak, and chin strap.

Blouse and trousers.—Olive drab without piping.

Emblems and shoulder straps.—Olive drab.

This change in uniform means that the navy will be the only branch with a distinctive uniform among the Soviet armed forces.—News item.

SOUTH KOREA

UN Project Ended

The United Nations Korea Reconstruction Agency (UNKRA), financed by 37 nations, has completed its work. During the six years it was in operation, UNKRA spent 140 million dollars on 4,800 projects in the war-ravaged Republic of Korea. The group's technical assistance program, a few unfinished projects, and a revolving loan fund for small businesses will be managed by the UN economic coordinator and the South Korean Government.

Projects completed include the construction of a modern cement plant, a glass factory, a 465-bed hospital, 9,000 low-cost homes, 258 irrigation projects, and school classrooms as well as many sanitation, education, welfare, and industrial developments.—News item.

GREAT BRITAIN

Big Military Helicopter

The *Type 192* helicopter, a developed version of the *Type 173* (MR, Jan 1957, p 71), is now in production for the Royal Air Force and 26 of the big helicopters have been placed on order. The turbine-powered *Type 192* is capable of carrying 18 fully armed troops on a long-range operation. The two *Napier Gazelle* engines of the *192* are arranged so that either engine can drive both rotors. Each engine normally produces 920 horsepower, but is capable of 1,650 horsepower for single engine operation. The aircraft has a maximum speed of 144 miles an hour and a range of 500 miles. Its maximum gross weight is 18,000 pounds.—News item.

Transport Version of Bomber

The *HP-111*, a military transport aircraft derived from the *Victor* bomber (MR, Sep 1956, p 73), will be able to take off with a run of 2,400 yards and carry a 53,000-pound load for 3,700 miles or a 15-ton load for 5,750 miles. Cruising speed of the *HP-111* will be approximately 550 miles an hour.—News item.

Wire-Guided Missile

The wire-guided Vickers *Type 891* antitank missile is in production for the British Army. The *Type 891* is a one-man weapon designed to be carried into combat by a soldier who can launch it without assistance at armored targets. The weapon, complete with carrying case which also serves as a launcher, weighs only 44 pounds. Wings and control surfaces are of solid plastic and the body of the missile is sheet steel. It uses a solid propellant. The operator controls the weapon by an optical viewer connected to the launching box by a cable. When the missile is fired the command control wires of the weapon are fed off a reel mounted in the launching box.—News item.

FOREIGN MILITARY DIGESTS

British Armored Divisions

Digested by the MILITARY REVIEW from a copyrighted article by Richard M. Ogorkiewicz in "Revue Militaire Générale" (France) February 1958.

FOR 10 years after the end of the Second World War the structure of British armored divisions remained virtually unaltered. In 1955 during maneuvers in Germany, however, an entirely new type of divisional organization was introduced on an experimental basis, and in 1956 this new organization was adopted as standard. A major change such as this makes it appropriate to recall some of the developments and ideas which preceded it and to compare the latest trends in the organization of armored formations in Britain and in other countries.

World War I

The development of ideas on British armored formations can be traced back to the First World War. Toward the end of that conflict the British Army had built a formidable tank corps which comprised no less than 26 tank battalions and which already had to its credit actions, such as Cambrai and Amiens, involving more than 400 tanks at a time. Moreover, the tank corps had as its chief of staff, General (then lieutenant colonel) J. F. C. Fuller, the foremost prophet of tank warfare. It was he who, in 1919, submitted a memorandum proposing a further extension of the successful employment of tanks.

In essence the proposal was that further progress should be through a gradual mechanization of the infantry divisions and it included a new organization in which each infantry battalion was given an organic tank company. There also was to be a tank battalion at divisional level, but to start with General Fuller suggested the formation of an experimental infantry brigade to carry out practical trials.

Some halfhearted attempts were made in that direction in 1920-21, and in the following year Captain B. H. Liddell Hart submitted an even further reaching proposal for a "new model division." This was, in effect, a large armored division which was to consist of three composite mechanized brigades, each of one heavy and one light tank battalion, and three small infantry battalions in armored carriers and mechanized artillery. There also was to be a divisional tank battalion bringing the total of tanks for each division to 300.

The All-Tank Force

However, it was only in 1927 that an experimental mechanized force was assembled on Salisbury Plain. By this time General Fuller had veered toward the idea of armored forces consisting almost entirely of tanks and the "all-tank" trend already had begun to exercise a powerful influence. It was foreshadowed in 1916 by General (then major) Martel in one of the first papers on the organization of armored forces and initially was inspired largely by the "landship" concept of the tank—a concept which visualized the tank as the direct equivalent of the warship on land. When this concept went out of fashion, the "all-tank" trend remained, kept alive by a desire not to hamper the mobility of tanks by the attachment of other elements to them and, partly, by overestimates of the capabilities of the tank on its own.

The mechanized force of 1927 certainly served to reinforce the difficulties of combination of various arms, although allowance should have been made for the hasty and rather haphazard fusion of its elements. It consisted of a reconnaissance element of tankettes and armored cars, a battalion of *Vickers* medium tanks, a motorized machinegun battalion, and the equivalent of an artillery battalion—partly towed and partly self-propelled. This force opened the way for the development of future armored forces, but the more immediate effect of its shortcomings, combined with the theoretical predilection for the "all-tank" ideas, strengthened the demand that armored forces should be composed largely, if not entirely, of tanks.

Thus after the force was broken up in 1928, further experiments which were resumed in 1931 were based on tanks alone. The 1st Tank Brigade, which was formed on a provisional basis in 1931, consisted of one light and three mixed—light and medium—tank battalions. Armored development continued on that basis until 1934, when the brigade was made permanent. Parallel with this, the first armored force manual issued in 1929 under the title of *Mechanized and Armored Formations* spoke in terms of tank brigades as the basic operational units.

This concentration on tanks alone certainly speeded up the development of mobile armored technique. But the concentration was only partly possible because the tank leaders, in their desire to exploit the newly found mobility, placed greater emphasis on strategic maneuvering than tactical performance. In consequence, it was possible for the armored forces to revive the mobile roles which horse cavalry could no longer perform but, through its neglect of tactical realities and of the need to supplement tanks with other arms, this deprived them of much of their potential versatility and usefulness.

The Mobile Division

The resulting trend toward limited roles for the armored formations was further strengthened by the decision to mechanize the cavalry and combine the mobile tank units (units of the Royal Tank Corps which were not assigned to close infantry support) with it. In fact, in the first mobile division, which was proposed in 1935 and which actually was formed in 1938, mechanized cavalry predominated. The division was looked upon as a successor to the cavalry division and its role was similar to that to which horse cavalry had been reduced toward the end of the 19th century, that is, mainly the limited role of strategic reconnaissance.

The actual organization of the mobile division consisted of one tank brigade with one light and two mixed light-medium tank battalions, two mechanized cavalry brigades each with three light tank battalions, two small artillery regiments, and two motorized rifle battalions. With its total of nine tank battalions and about 600 tanks, mainly light, it was a badly balanced organization: there were far too many tank units and far too many light

tanks in relation to its size and its other troops.

Some of the shortcomings of the mobile division were corrected in 1939 when its name was changed to that of armored division. The new organization comprised only two armored brigades: one, called "light," consisted of three mixed battalions of medium or "cruiser" tanks and of light tanks; the other, called "heavy," consisted of three medium tank battalions. At the same time, however, the divisional troops were reduced in strength and concentrated into a support group consisting of one rifle battalion, one small artillery regiment, and an engineer company. As a result, although the number of tank battalions was reduced from nine to six, the ratio of infantry to tanks became even worse because there was now only one rifle battalion to six tank battalions, instead of the original ratio of two to nine.

The proportion of infantry to tanks was improved somewhat in the early part of 1940 when a second rifle battalion and a mixed antitank/antiaircraft regiment were added to the support group. Simultaneously, the distinction between the two armored brigades was abandoned and each was reorganized on the basis of three medium tank battalions.

World War II

A far greater change, however, came about in the second half of 1940, after the French Campaign. A divisional armored car battalion was added for reconnaissance and the mixed antitank/antiaircraft regiment was replaced by two separate regiments, one of towed 40-mm antitank guns and one of 40-mm *Bofors* antiaircraft guns. The support group lost one of its two rifle battalions but one rifle battalion was added to each armored brigade, so that the total number of infantry battalions per division rose to three against six tank battalions.

The lessons of the 1940 French Campaign and the example of the victorious German armored divisions went even further, however, than an increase in the proportion of the infantry. The prewar plans which consigned more tanks to infantry support and envisaged only three armored divisions were revised drastically. The sights were raised to nine armored divisions and the long-term plans grew to the equivalent of about 18 armored divisions. What was even more important, armored divisions finally were recognized as versatile fighting formations and fought as such from the first Libian Campaign to the Battle of El Alamein and the drive to Tunis in 1942 and 1943.

By this time the organization was even more similar to that of the German armored divisions as a result of a new organization introduced in 1942. There was still the armored car battalion and one armored brigade organized as before, but the second armored brigade was replaced by a three-battalion motorized infantry brigade. The support group also disappeared, all the artillery—increased by a second regiment of towed 25 pounders—was placed directly under divisional control.

As a result of these changes the number of infantry battalions for the first time exceeded that of tank battalions. There were now four infantry battalions against three tank battalions per division. This increase in infantry strength was inspired partly by the example of the German armored divisions and partly by the more difficult conditions envisaged in the next theater of operations—the continent of Europe. The latter consideration, together with improvements in antitank defense and a reaction from the favorable conditions of the Libian Desert, produced some weakening of faith in the fighting power of armored formations. The number of divisions was allowed to dwindle from the total of 11, which were actually raised, to only five, while that of armored units for infantry support increased. At the same

time the old and once discredited concept of the limited role of armored formations appeared again. On the eve of the invasion of Eurpoe a War Office manual once again proclaimed that armored divisions were only "designed for exploitation."

Actually, once they landed in Normandy, British armored divisions participated most effectively in winning a decision, as well as exploiting it subsequently in the drive across France and Europe. The only effect of the erroneous theories about the limited role of armor was to handicap the armored divisions by the bias in their training and by the inadequate armament of their tanks designed on the principles of the exploitation role and of undergunned mobility.

The 1944-45 organization basically was the same as that introduced in 1942. However, the armored car battalion was replaced by a reconnaissance battalion of fast medium tanks and one of the two artillery regiments was self-propelled, as was part of the antitank regiment. The same basic organization was retained after the war but with a number of modifications and additions. The reconnaissance role again was taken over by an armored car battalion and the armored brigade was given a fourth tank battalion; a little later a fourth infantry battalion was added to the motorized infantry brigade, thus making a total of five infantry battalions to four tank battalions per division. In addition, both artillery regiments and the antitank regiment were self-propelled, although subsequently the latter was eliminated and the infantry brigade reverted to a total of three infantry battalions.

Postwar

A greater change than in the organization took place in the general outlook. After a period of postwar hesitation, British armored divisions gradually were accorded the importance they deserved as the most effective element in ground warfare. When war broke out in Korea British forces in Germany were strengthened —three of the four British divisions were armored.

For a time, the three British armored divisions represented the most effective element of the NATO forces facing the Soviet armies, whose most important striking force has always consisted of armored formations. Nevertheless, by the early 1950's the organization of these divisions left a good deal to be desired. For one thing they had grown large and cumbersome. Their infantry, except for the organic battalion of the armored brigade, still was carried in trucks of indifferent cross-country performance and had only limited capacity for close cooperation with tanks. The artillery, with its 87.6-mm gun-howitzers, was no longer in keeping with the increased gunpower of modern tanks.

In view of this, it was inevitable that a new type of organization should have been tried in 1955. Under the new organization the size of the division was reduced drastically so that it came to consist of four tank battalions directly under divisional control, and one battalion each of armored cars, armored infantry, medium artillery, and engineers.

New Organization

Many of the changes introduced with the 1955-56 organization were only to be applauded. They include the over-all reduction in size, simplification, reduction of headquarters, and the replacement of the light artillery by a smaller number of larger caliber units. But it is extremely doubtful if the same could be said of the wholesale reduction of the divisional infantry and the return to the "all-tank" ideas. There is now only one infantry battalion to four tank battalions, whereas all experience and logic show that the ratio should be close to one to one.

Even more disturbing has been the tendency to consign armored divisions once again to the limited roles of exploitation. In fact, the limited role of armor has been

proclaimed officially in the 1956-57 Army Estimates. This runs counter to all the experience in the employment of armor during the last 17 years, just as the organization of the divisions runs counter to many trends in the evolution of armor. The new policy can be regarded only as regressive and one which is in danger of bringing the armored formations back to where they started 20 years ago.

At the time there was at least some practical reason for confining the role of the budding armored forces. On one hand, they still had to develop much of their operational technique; on the other there was good reason in not trying to claim too big a role at first in view of the opposition which mechanization was apt to arouse generally at the time.

There was no fundamental reason, however, why the role of armored forces should remain permanently confined to that to which horse cavalry had been reduced by technological development. There was no fundamental reason why armored formations should not evolve into a new type of fighting force, combining mobility with striking power—and not merely a mobile auxiliary.

The Germans, and Guderian in particular, were the first to recognize this clearly in their Panzer divisions. These units differed from the earlier "all-tank" formations in that they no longer relied on tanks alone but, instead, on a combination of several arms. They acted as versatile fighting formations which were capable of both decisive action in battle and exploitation.

The advantages of this type of approach were recognized generally in the early part of the Second World War and, following the German example, this type of versatile armored division—based on the integration of all arms at divisional level —was adopted almost universally. In general, the divisions of this period consisted of a tank brigade backed by a motorized infantry brigade—in contrast to the original armored formations based principally on tank brigades.

By comparison with the "all-tank" formations, the new type represented by the Panzer division had much wider capabilities and acquitted itself well in a wide variety of defensive as well as offensive actions. However, in action the combination of various arms at divisional level did not prove sufficient, for while several setpiece battles were fought by entire divisions the great majority of armored actions was fought in tactical groupings of smaller size. A variety of factors contributed to this, including the terrain, the need for closest cooperation between tanks and infantry in mobile operations, and the growing power of modern arms—particularly that of tactical air forces.

A few proposals for the combination of tanks, infantry, and artillery below divisional level already were made before the Second World War. It was, however, only during the war that the Germans introduced the system of small, mixed tactical groupings, or *Kampfgruppe*, and were the first to exploit it with great success.

New Units

However, the Germans did not carry this development to its logical conclusion, and did not reorganize their Panzer divisions in line with their method of operating in mixed tactical groupings of smaller than division size. This was left to the Americans who abandoned their original, 1940-41, brigade-based armored division organization in favor of one based on self-contained battalions and combat command tactical headquarters capable of assuming command of any combination of battalions.

This type of organization, where units of various arms are grouped into mixed brigade-size teams or combat commands, formed the third phase of the development of armored formations. It has since

been adopted by the French Army but not the British which, until 1955-56, remained faithful to the organization of the second period based on a tank brigade backed by an infantry brigade.

The mixed battle teams of the American armored divisions and the *Kampfgruppe* of the Panzer divisions did not stop at combat command or brigade level. Task forces or combat teams of battalion or even company size showed that even smaller tactical groupings were both needed and practical. In view of this it was inevitable that in time a new type of organization should appear that combined tanks, riflemen, and other arms at even lower levels—of battalion at least.

The first of this type of unit were the American light armored cavalry regiments and the tank regiments of the Soviet tank divisions, both of which appeared soon after World War II. The former essentially are independent light armored brigades and consist of three battalions, each of which has one medium tank company, one assault gun company, and three reconnaissance companies of riflemen and light tanks. The Soviet tank regiments have been equivalent in armored vehicles to Western tank battalions but they embrace a small infantry battalion as well as assault guns and thus form a self-contained battle group. A third and more recent example are the French *Regiments Inter-armes* which consist of two companies of *AMX 13* light tanks, two rifle companies, one reconnaissance company, and one company of 120-mm mortars.

The trend in the direction of such relatively small self-contained battle groups as the basis of armored units is inevitable in view of modern battle conditions and, in particular, the advent of tactical nuclear weapons. Moreover, it is part of a much more general trend as shown by the new type of French mechanized infantry division, and the recently reactivated United States 101st Airborne Division, both of which are based on five self-contained, battalion-size battle groups.

The organization based on self-contained, battalion-size battle groups, which combine riflemen with tanks and other mobile heavy weapons, thus can be seen as the outcome of the lessons from the employment of the infantry, as well as the logical outcome of all the trends in the evolution of armored formations. The former has shown clearly the need for mobile heavy weapons—such as tanks—within the framework of the smallest infantry units. The latter has shown the need for the closest integration of tanks with riflemen and for combining units of both in roughly equal proportions.

British Armor

These points appear to be ignored completely in the organization of the 1955-56 British armored division which is based on four homogeneous tank battalions supported by a single infantry battalion. What is more, the new policy concerning British armored divisions—that they should be confined to certain roles and that only the infantry division is to be regarded as the basic versatile fighting formation—ignores two basic facts. The first is that the difference between modern armored and infantry formations is only one of degree and not principle; the second is the demonstrated versatility of armor.

In view of all the past experience and present capabilities, the relegation of British armored divisions to the limited, specialized role, appears quite unrealistic. So does the method of coordinating the action of infantry with armor at the level of divisions—which is clearly implied in the distinct roles given to infantry and armored formations, and the revival of the "all-tank" trend. Both are obviously moves in the opposite direction to the general trend toward close integration of various arms at the level of the battalion battle group and toward even more versa-

tile employment. What is more, there seems very little room on a future battlefield for a large, limited-role, specialized formation.

One can only hope, therefore, that the current organization of British armored divisions represents only a passing phase and that it will be replaced soon by one more suited to the latest conditions and needs. One must hope also that this will be accompanied by a better understanding of the potentialities of armor and a new policy restoring greater scope to armored formations in general.

The Psychology of Fear

Digested by the MILITARY REVIEW from an article by Lieutenant Colonel K. E. Lindeman in "Ny Militär Tidskrift" (Sweden) Nr. 10, 1957. Translation by Mr. LaVergne Dale, Leavenworth, Kansas.

THE concept of fear is by no means a theoretical matter, but a real factor among the phenomena of war and one which deserves great attention. The professional military have a definite interest in diagnosis and analysis of the occurrence and character of fear, for it is obvious that if the nature and cause of fear can be discovered, the chances are better that its subsequent occurrence can be prevented.

We know so little about mental anguish on the battlefield because national pride and military prestige tend to forbid a matter-of-fact discussion and study of the phenomenon.

The Fear Concept

The capacity to fear, or to be afraid, lies deep within the mind of every soldier. The soldier who says that he has never known fear is lying, or else he does not possess the normal instinct of self-preservation. As Maredock Nay said: "A triple liar is the person who boasts that he has never known fear."

All know fear, but all do not show it—these are the so-called brave. Even the most courageous can become afraid. One can only learn how to combat fear, not how to overcome it wholly, for bravery consists in the ability to repress the overly excited instinct of self-preservation. One of the strongest impressions one receives when he faces the enemy for the first time is that he is afraid. The only difference between a courageous and a cowardly man is that the courageous one is able to control his fear, while the cowardly one cannot.

The instinct of self-preservation is very dominant. Its manifestations differ with different persons and alter with every individual.

Fear of death is the soldier's most dangerous enemy. It never lets go of him entirely but always continues to exist, more or less controlled by his will. The anxiety, nervousness, or agony of mind by which fear under certain circumstances is accompanied, develops at times into terror and panic; even a highly developed human being perceives the world about him from a lower mental plane. The instinct of self-preservation is, indeed, very strong, and there is no need to pretend that such is not the case.

Psychological Angles

Courage is not an absolute concept—one day bold, another day cautious, is not unusual. Boldness in one case does not exclude excessive cautiousness in another for courage is not something that one permanently acquires. The question of fear and courage is by no means as easy to answer as many are inclined to imagine, and is certainly more complicated in the

modern war of machines. Here, more than ever, a spiritual power of resistance is required.

Primitive instinct counsels the soldier to conceal himself or flee. Highly tensed nerves strained to the breaking point often give way. A dense artillery concentration or a bombing attack can be a sufficient cause. The belief that one is surrounded, or knowledge of the fact that the enemy's tanks are breaking through, has a similar terrifying effect.

Lack of success, loss of sleep, hunger, thirst, heavy losses, bad weather, or enemy fire produce depression. Long waiting also is depressing. Action itself does not make such heavy spiritual demands, and agitation of mind is greatest during the preparational phase before the action itself begins.

Everything that is wearing to the physical body also fatigues the mind. "Tired men become more frightened," it is said. Therefore, good health, training, and rest play a major role in the defeat of fear. Confidence in command, confidence in weapons, and, above all, successes achieved, are of great significance. Initial success is of great value. Likewise, the feeling that the cause one is fighting for merits not only his effort but also sacrifice is important in the creation of courage and self-confidence.

Battle Experience

Probably most persons have asked themselves how it feels to go into battle and to be face to face with death. Quite naturally, no general reply to this question can be found. It is difficult to judge whether a soldier will have normal "combat reaction," that is, how his fear is constituted. There are some who succeed in keeping their reactions in hand in critical situations, but how a person will react in battle is not known until during or after the opening of the enemy's fire on him.

In the absence of battle experience, every group of forces experiences the psychosis of fear at its first encounter with the enemy. Even the best of training and discipline can be inadequate for suppressing this phenomenon. Behavior varies greatly from soldier to soldier. Possibly in no case will it be entirely heroic. Gradually, however, the man learns to act logically and simply—in the way that is best calculated to save his life.

The modern soldier's encounter with war is brutal and usually possesses the ingredients which render life an inferno. But it can be observed how the will and the ability to overcome lack of courage and fear of death increase with every failure. The combatant becomes firmer and more dogged in his efforts, and a young man's eyes are opened in the face of the bloody reality of killing. They first become accustomed, curious, then eager, and, finally, hardened—surer and more brutal in their fearlessness. Even those who begin the war as youths are changed into defiant men.

It is also true that experiences, especially severe ones, may reduce lust for battle. Units with high casualty figures are less disposed to fight than those which have been through a similar hazardous experience with low casualty figures.

The Unknown

The unknown is always hazardous. Excessive noise, unclear situations, anything which has no clearly evident cause and is frightening and mysterious is productive of fear. The frightened person sees everything, but he sees reality in another light. Bushes and shadows become enemy soldiers and sounds are heard which do not exist. The surrounding world on the front is seen in darker colors and more filled with danger than it actually is.

Often preconceived ideas concerning something that is scheduled to occur gives rise to fear as great—if not greater—than the occurrence itself. A clear understanding of coming dangers diminishes their effect, while suspense relative to an un-

defined, dangerous situation intensifies the feeling of fear.

Absolute stillness alternating with the mighty noise of battle can irritate. In the case of a unit suddenly confronting a situation that is the very opposite of what has been reported, the resulting surprise often is sufficiently great for fear emotions to present themselves. A unit which is to fight with confidence must be given unfavorable as well as favorable information. *The less surprise a combat situation presents, the more quickly is the soldier able to adapt himself to it.*

Keep the unit informed of the situation is an old and good rule. This is a factor which contributes toward keeping the soldier in check and which helps him to contemplate danger more calmly. Actual knowledge and orientation concerning danger and situation are useful. In order to be able to "stand the strain" in trying situations, he must know what he is fighting for; the worst thing in the face of danger is the unexpected. Knowledge concerning situations means that fear already is half overcome and mastered.

Solitude

There are moments when it is difficult for a man to stand alone. Nothing terrifies a soldier more than to be alone with his fear. The worst thing is his thought of the emptiness of the space about him (his field of battle) and his helplessness in just that place. This gives rise to overwhelming anxiety with regard to his safety. In such a situation being alone appears unendurable; for this reason he seeks to find the company of others, cost what it may. Comradeship contributes toward suppression of fear, and one is never so afraid as when he knows he must face danger alone. There is nothing to be found that makes for calmness in battle more than nearness to someone else who is not possessed of fear or panic.

The soldier will feel that someone else is sharing his burdens. If he is with others in a unit with a leader of established powers and recognized authority he is more calm. It is well to mix experienced and courageous men with beginners and men with less self-control.

Panic

An extreme form of fear and terror is panic. During our last war we experienced the problem and saw that cool and confident—almost phlegmatic—soldiers were not exempt from manifestations of panic. Panic occurs in all armies, good as well as bad. In certain situations troop units of especially good morale and in spite of good command may fall victim to panic.

Panic in its true sense is the condition when the mass of the forces, in the face of danger, suddenly is seized with the feeling, "Every man for himself." Each and every one is engaged only in seeking to save himself. It is an extreme manifestation which is a common phenomenon with all living beings. No one can escape the effects of flight psychosis if he chances to be within its circle of influence.

Fear acts in a hindering and crippling manner on thought activity, power of action, and initiative. Under certain conditions, fear obliterates every trace of rationality and does away with all rules of discipline, honor, and propriety. Often losses occur for those who, for example, in the case of a tank attack, in panic abandon the foxholes which have given them protection. Flight, in many cases, can be hazardous both for the individual or unit. Continuing to fight may mean to continue to live, while flight may mean that one will be killed.

The commander must try to eliminate hysteria and panic which can lead to the complete breakdown of psychically disturbed individuals. Some of those who have panicked can be returned to the front after treatment. Very simple measures often are sufficient for first aid. As a rule, food, sleep, and a calming influence constitute adequate treatment.

In the more intimate circles and in modern *belles-lettres* which deal with war it is not considered shameful to admit that one sometimes has been afraid. It was quite natural—those who go to pieces are classified as medical cases.

Discipline

Discipline overcomes fear. A poorly disciplined unit displays the same weakness and fear that are habitually manifested in a heterogeneous crowd, for it is only discipline that transforms a crowd of individuals into a unit. A well-disciplined unit does not allow itself to be terrified by a suddenly appearing danger, but a poorly disciplined unit reacts as a simple mass of human individuals and scatters in unreasoning flight. In view of this fact it seems unbelievable that there are persons who undervalue the importance of discipline and training.

An acquired and firmly fixed habit of sure handling of weapons and of properly conducting oneself under different and changing circumstances is productive of self-confidence. This counteracts the influence which settles upon and fixes itself on the combatant—especially the beginner.

Discipline should, therefore, become partly a habit. Discipline, in conjunction with habit and perhaps to some degree by reason of risk of punishment, exercises a restraining effect on the individual's fear instincts in certain difficult situations.

Mastering Fear

Every success crosses two thresholds: first fear is conquered, then the enemy. The task is to overcome fear and seek to attain a condition in which fear is not present, which we call courage. Fear is inseparable from war, but it can be combated. It is hard to be courageous, but fear can be mastered more or less successfully by an effort of will. There are many different types of fear to be controlled.

The cause of mental anguish can never be completely removed. On the other hand, there are certain possibilities of preventing it from finding expression in the form of dangerous tendencies. One means is discipline, which we have already mentioned. Discipline is an effectual factor when fear is to be combated. However, there are many cases when it has to be fortified with other means.

The atmosphere of the field of battle gives birth to mental tension. Tension seeks an outlet. If the unit is obliged to wait during a bombing attack or artillery bombardment before it is able, for example, to make a counterattack, it may be wise to distract the men's thoughts from the dangers of the moment by compelling them to engage in some form of activity. The command must, in that case, see to it that each and every one has something useful at hand to do. Action tends to prevent a breakdown of courage. Momentary waiting and inaction must be replaced by active, purposeful activity. Otherwise, tension mounts and may assume a detrimental form.

The soldier's fear is canceled out by the work he must do. Lying idle in the enemy's artillery preparation can be the most terrifying thing a man can experience. By conversing with his comrades he escapes his own thoughts and prevents an all too gloomy state of mind from developing. An amusing remark made by some witty individual often is able to transform severe tension into a good laugh. Work and some good task to perform are the best remedies for nervous tension and trying situations.

Combat efficiency in a unit depends partly on the methods employed in seeking to keep fear under control. This means that by schooling the higher personal values are developed—schooling of the soldier's will to keep himself in hand. Training plays its distinct role. Ways and modes of action must be sought that provide counteraction against fear.

We must start with the premise that

fear is a natural reaction which can be mastered to some degree. Realistic training exercises, stressing terrorizing situations together with sound effects, increase self-confidence and also are mentally hardening. It is not alone the battlefield's explosions, its smell, anguished cries, fallen comrades, and many other impressions against which the soldier must be hardened, but his self-confidence must be built up by means of a continual instructional process. He can be partially "vaccinated" against fear by his training if all means are employed.

An exalting and compelling idea which imparts the requisite will and readiness for sacrifice must be cultivated and developed. A strong love for native land or some other comparable sustaining feeling gives strength in difficult situations. Troop and corps spirit must not be forgotten in this connection. If the soldier feels that he belongs to an invincible unit, there will be no limit to his efforts and self-commitment. A sense of duty which knows no compromise cannot be valued highly enough when courage is being tried. A feeling of pride with regard to prior engagements with the unit and a desire for special recognition makes the soldier more fearless in the face of danger. The soldier's schooling must instill in him strict views with regard to honor and duty.

Moral Courage

One of a commander's principal characteristics is that he should possess the courage to accept responsibility. Moral responsibility can be a heavy burden for a person in a position of leadership. He is obliged at times to request the extreme, and moral courage is required constantly.

The moral strength of staff personnel very often is tried in the conduct of their activities. There are staff members who do only those things that are pleasing to their chief. There can be a struggle between loyalty to the commander and belief in their cause.

Courage thus can be required outside the sphere of enemy action. It is worthy of note that many have greater courage in the face of the enemy than under peaceful circumstances. This latter often has been designated as "civil courage."

National Courage

One hears it asserted at times, with great positiveness, that there are peoples and nations more courageous and cool-headed than others. It is insisted that courage is especially characteristic of certain races.

The Chinese have long been represented as almost useless as soldier material. During the last war, on the other hand, the Chinese armies displayed supreme bravery.

The Russian soldier has been estimated very differently in different periods.

The French soldier was respected as a tough opponent by his German adversaries. We need only to call to mind the French and the German soldiers of the battles of World War I. There appear to be many factors which effect this: training, war objective, political factors, and leadership. In any event, the concept of courage is not a constant national characteristic.

Leadership

The leader captures attention by his own inspiring conduct. Troops are always inclined to follow a leader who is able to draw them after him and exercise his command over them in the proper manner. There are commanders who instill a desire for action in their men. It must be apparent to the men that the one who is leading them is less afraid than they are. A courageous chief seldom has cowards among his men, for the example of the superior makes for bravery in those under him. Troops always expect composure and impassivity in the face of crises, and the commander must maintain composure in all situations.

The chief must possess an independent and firm mind. He has no one on which to

lean. In dangerous situations his men look instinctively in his direction and if he shows the least sign of being afraid, their combat ability will be diminished instantly, even if it does not disappear entirely.

A clear mind is an invaluable possession of both commander and men. He who does not possess inborn optimism should make it his rule to force himself to have a hopeful outlook on the situation that may be confronting him. Courage is dependent on the art of thinking optimistically.

The Sea--Key to Air Supremacy?

Digested by the MILITARY REVIEW from a copyrighted article by Squadron Leader L. W. Davies in "Journal of the Royal United Service Institution" (Great Britain) August 1957.

The giant airbases of today will become the bomber cemeteries of a future war.

—Zhigarev, Commander in Chief, Soviet Air Forces

AT THIS stage in the evolution of aerial warfare one might confidently assume that, in the future, at least one factor can be ignored safely—the requirement for water-based aircraft. The controversy between those in favor and those against the equipment of British Royal Air Force squadrons with this type aircraft has raged for many years and, temporarily at least, the anti-'boat school appears to have won the day. There are no foreseeable replacement types of flying boats under construction in Britain and the last such squadrons can be expected to go out of service within the next two or three years.

This apparent national antipathy to a class of aircraft which has existed in one form or another throughout the history of British aviation is reflected in the policy of our nationalized civil airlines, which also have turned their backs upon the flying boat, even though the three *Princesses*, the largest aircraft ever built in this country, are available—albeit cocooned and without engines—on the banks of the Solent River.

Despite the flying boats' advantages of flexibility, strategic mobility, independence of expensive runways, and their competitive performance with contemporary landplanes, the government has decided in favor of land-based aircraft. No doubt the multitude of runways bequeathed to the nation as a result of World War II influenced this decision to a certain extent. The ministries concerned have rightly pointed out that the argument that the flying boat does not require expensive runways is hardly valid because there are plenty of runways already available. Furthermore, present-day flying boats in service are slow, difficult to maneuver on the water, require specialized bases, and are subject to the vagaries of wind and tide. These points are only too pertinent and have been supported by strong economic arguments.

Many have regretted this passing of the 'boats, and hark back with nostalgia to the days of their prime. However, with the *Sunderland* as the only example of a modern service flying boat, and with no replacements in sight, they have concluded regretfully that these aircraft, like sailing ships and stage coaches, are things of the past and can have no place in an air force of the nuclear age.

During the last three years, however, the development of thermonuclear weapons has shown clearly that the chances of fighting a classical battle for air su-

premacy from this country will have a problematical chance of success due to the smallness of our island, our geographical proximity to the enemy, and, above all, the comparative ease with which our airfields could be neutralized by nuclear bombing or radioactive fallout. Fortunately, as the prospects have become more and more somber, behind-the-scenes aerodynamic and hydrodynamic

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***Auster J5G* in hydroski takeoff**

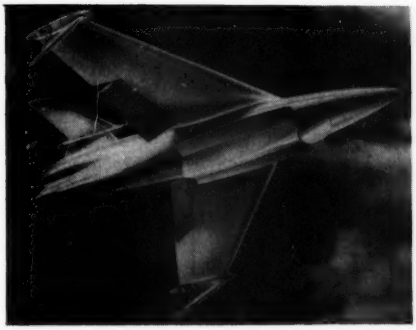
research and development have proceeded to such an advanced stage that we now can reexamine the entire question of basing at least some of our air forces upon the water, and thereby reduce our dependence upon our vulnerable airfields.

Nuclear War

Before we consider the modern potentialities of water-based aircraft, let us take a quick look at the British Isles a few hours after the outbreak of an all-out nuclear war. Assuming that the enemy has decided upon the elimination of this country, there does not seem to be any firm reason why at least some of his bombers should not succeed in penetrating our defenses, however efficient might be our early warning system, fighters, and surface-to-air guided missiles. If we could be certain of a 100 percent interception and kill-rate, there would be little to fear, but unfortunately, this cannot be guaranteed, especially as the enemy is likely to strike the first blow.

It has been estimated that the fallout of a single megaton bomb, dropped on Liverpool during a westerly wind, would effectively put out of action all the population living within a 20-mile wide belt of land downwind of that city and extending as far as the east coast. This radioactive plume would be no respecter of persons, and airfield personnel would be equally affected. It does not take much imagination to appreciate that about 12 such bombs—it may be less—dropped simultaneously on selected west coast towns could, within a few hours, paralyze both our air defenses and our ability to launch a nuclear counterattack.

The nuclear deterrent, about which so much is heard these days, depends upon



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Model of hydroski fighter now under development. Note retractable wingtip 'skis

our ability to get our *V*-bomber force into the air at short notice. In theory this concept might be sound, but in practice the enemy might well succeed in destroying or neutralizing a large portion of the force on the ground, especially if our airfields were his primary target. A comprehensive dispersion of bombers to other airfields certainly would help to mitigate the effects of the attack, but the number of

airfields suitable for large bomber aircraft is not unlimited, and their chances of avoiding the radioactive plume might be small, particularly if the wind direction was erratic.

New Techniques

Where then can we look for an alternative should our airfields be neutralized? The answer, perhaps, is the sea around our shores. This traditional element in our (British) island defenses has played but a limited part in the defense of our airspace because of its unpredictable nature. Aircraft based upon it have until now been restricted to slow flying boats and to carrierborne aircraft whose bases are even more vulnerable than the concrete runways ashore.

Recent developments in hull design and, more important, the invention of the hydroski have shown, however, that the roughness of the sea need no longer be a limiting factor. Moreover, it is now a practicable proposition to operate all types of military aircraft from mud, wet sand, snow, and ice as well as from land and water. A new word for this ability to operate on all surfaces—*pantobased*, from the Greek *pantos*—has been coined and is likely to be heard more and more frequently as the potentialities of this type airplane come to be appreciated.

Both in the United States and in this country the development of hydroskis has proceeded rapidly during the past three years. The United States Navy *Sea Dart* and the British converted *Auster* are examples of aircraft which have operated successfully on hydroskis.

Briefly, the hydroski is a nonbuoyant hydroplane, suspended below an aircraft, which keeps it waterborne at speeds of 20 knots and above. The skis can be fitted to existing landplanes or flying boats as conversion kits or they can be an integral part of an aircraft equipped with a buoyant fuselage, as with the *Sea Dart*. They can be retracted flush in flight, thus offering no extra drag, and their angle of incidence can be varied automatically during the takeoff and landing runs to obtain the most efficient hydrodynamic effects according to the state of the sea. Fitted to the hulls of flying boats they now make possible efficient alighting and takeoff in all but the roughest midocean sea conditions. Coupled with the greatly increased values in hull-to-beam ratios which are now possible, it is, at long last, a practicable proposition to base flying boats in mid-Atlantic for lengthy periods.

When used in combination with normal undercarriages aircraft fitted with hydroskis can operate at will without further modification from land, water, mud, wet sand, and snow. Extensive tank tests and trials with full size aircraft have shown that spray is diverted easily from jet intakes and propellers, water loads on buoyant fuselages are halved, and, where a normal nonbuoyant landplane is equipped with hydroskis, a 25-yard concrete or pressed steel plate (PSP) ramp or beach is all that is required for the beginning or end of a sortie. For the first time in aviation history, amphibious aircraft can be landplanes equipped to operate from water rather than the traditional hull-shape aircraft fitted with wheels. How can this revolutionary concept be utilized in our various categories of military aircraft, and should the flying boat of the future have a place in our operational requirements?

Maritime Warfare

We are a maritime nation and in the foreseeable future we shall continue to depend in peace and in war upon our merchant marine. The greatest threats to our shipping are likely to be attacks by aircraft and submarine. So far we have countered these threats with escort vessels, carrier and shore-based aircraft, and flying boats. In a future war the escort vessels are likely to be superseded in effectiveness to an ever-increasing extent

by aircraft. These may be from carriers or they may be shore based. Our carriers, however, are few, expensive, and are highly vulnerable. If they are sunk, even those of their short-range aircraft which already are airborne will be lost, unless they are within reach of a friendly airfield that has not been neutralized by nuclear attack.

Long-range, land-based maritime aircraft, with their ability to cover vast

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Model of ocean patrol flying boat design with hydroskis

areas of ocean, should be able to afford a more comprehensive antisubmarine protection, but they would be of little use against enemy air attacks and they, too, might find their home bases neutralized by nuclear attack. It would seem, therefore, that a surer and more economical method of antiaircraft defense of merchant convoys would be an adaptation of the World War II method of arming merchant ships with catapult-launched fighter aircraft, but with a difference. Each jet fighter, launched by steam catapult, could be fitted with a hydroski which would permit it to alight on the water and taxi alongside its ship where it could be hoisted aboard without the ship having to reduce speed.

In very rough seas the fighter probably would be unable to taxi and would have to be abandoned, but the hydroski, which takes the main landing shock and prevents the nose of the aircraft burying itself beneath the waves, would make a safe landing certain and there would thus be no need for the pilot to bale out. Until the advent of vertical takeoff and landing fighters or ship-to-air guided weapons, this conversion of existing fighter aircraft appears to offer a solution to the convoy air defense problem.

The threat from the submarine is, however, the navy's primary concern. It is here that the modern flying boat could really come into its own—modern, that is, in that such an aircraft already has been designed and for which scale model trials have been successfully completed. Details are necessarily classified, but it can be disclosed that such an aircraft, equipped

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The *Princess* can carry large payloads over exceptionally long stages

with a hydroski beneath its hull, could operate in seas with waves up to eight feet in height.

United States Navy Department Hydrographic Office charts show that in mid-Atlantic the sea height is below eight feet for 90 percent of the year and that even in January and February, the worst months, this figure is not exceeded on an average of five days out of seven. It will

be seen, therefore, that it could be based in mid-Atlantic for indefinite periods in all but the very worst weather. It could either be replenished with fuel, armament, supplies, and relief crews from a mid-ocean depot ship or whaler, or it could refuel from an offset paravane-borne hose-coupling towed behind, and to one side of, one of the ships in a convoy.

With this midocean refuelling base, aircraft transit time would be reduced greatly, permitting far longer periods "on the job." Complete coverage of the entire Atlantic Ocean north of a line between New York, the Azores, and Gibraltar could, therefore, be provided by normal patrol flying boats and land-based aircraft, with a radius of action of 750 nautical miles, using only two land bases, one in Canada and one in the United Kingdom. Without the midocean base, five land bases would be required for adequate coverage using aircraft of the same radius of action.

When one remembers that three-quarters of the world's surface is covered with water it seems odd that Britain's maritime warfare effort is to be the responsibility of land-based aircraft. A flying boat, such as has been described, would be a far better proposition if our convoys are to be provided with adequate antisubmarine protection in nuclear war.

Air-Sea Rescue

What has been said for the flying boat applies equally to the search and rescue flying boat or amphibian. While helicopters still are limited by range and weather, there is undoubtedly a requirement for a successor to the *Walrus* and *Sea Otter*. The same aircraft already described could fill the gap adequately. Without it, it is hard to believe that our search and rescue organization could be as operationally efficient as in the last war.

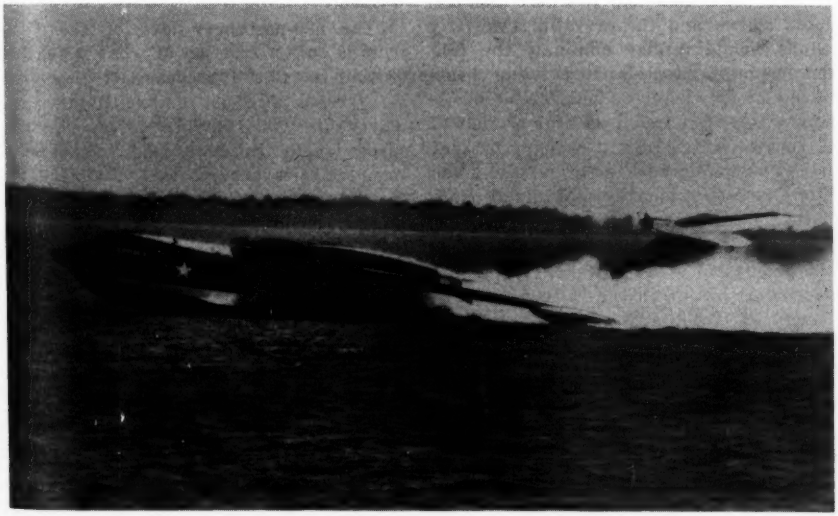
Amphibious Warfare

In a future war we may not again be called upon to launch combined operations on the scale of *Overlord*, but in warfare nothing is certain. It might be necessary to land troops, vehicles, and supplies across beaches as was done on the north Egyptian littoral during the recent Port Said landings. Designs now exist for transport flying boats capable of taxiing up a beach and discharging their loads through clamshell nose doors. The hulls would be strengthened for beaching and a kedge anchor would be fitted in the tail to assist refloating. Alternatively, time-expired aircraft could be equipped with hydroskis for a "once only" beaching.

These flying LCT's could greatly enhance the effectiveness of beach landings. No longer would it be necessary to subject the troops for long periods to sea sickness and concentrated fire from the shore defenses while their highly vulnerable landing craft approached the beaches through rough seas, surf, and underwater obstacles. Moreover, it is quite likely that such a landing would achieve complete tactical surprise because the amount of shipping involved would be reduced greatly. Provided the flying boats were sufficiently large, even the heaviest equipment, such as tanks and artillery, could be landed. The length of the subsequent critical buildup period also could be greatly reduced as the air shuttle would largely replace the slow-moving shipping shuttles of past invasions.

It does not need much imagination to appreciate the tremendous degree of flexibility that a force of such aircraft would have provided the allied commanders in the recent Egyptian campaign. Instead of the delays and restrictions necessarily imposed upon them by slow-moving surface ships and landing craft, which confined our assaults to the northern littoral, a wing of these water-based aircraft could have embarked the troops in the

same loading areas—Malta and Cyprus—but could have then landed them at both ends of the Suez Canal, as well as on the Bitter Lakes in the middle. Instead of a five-day delay, once air supremacy had been achieved, the entire canal could have been under the control of the assault force within a few hours takeoff from the embarkation ports. In this way the military campaign would have been over long before world political events had caught up with it, with consequent political and economic results far more favorable than now obtain.



US Navy Photograph

The United States *Seamaster* jet flying boat can carry a payload of 15 tons

Transport

It is in transport, perhaps, that the flying boat of the future could play its most effective role. In this discussion we are concerned with military aircraft, but with transport aircraft there is a close relationship between the military and civil roles. We should not forget that most of the world's major cities have been built by sea, lake, or riverside. Civil flying boats are, therefore, able to deposit their passengers close to the city centers and thereby eliminate the wearisome coach journey, averaging some 15 miles, between airfield and city terminus. The modern flying boat airliner is more comfortable and can carry greater payloads than the landplane. If our airlines could be persuaded to operate modern flying boats—and the *Princess* is only the forerunner of far greater boats to come—such aircraft would form an invaluable reserve for wartime.

In a nuclear war the United Kingdom might find itself completely cut off from sea supplies should enemy nuclear attacks make the approach of merchant shipping impossible. These could cause widespread starvation and national disaster, but a determined air force could continue the fight provided some of its aircraft were large flying boats equipped with hydroskis. No doubt all available airliners and

land-based transport aircraft could, and probably would, be pressed into service. But supposing the airfields were out of action, either because of nuclear cratering or fallout? We would have to look to the sea for our salvation and upon that sea, off our western and northern coasts, large transport flying boats could alight from overseas.

It is most unlikely that the sea itself would be radioactive for long, except for certain limited areas where tide and Gulf Stream could not help to dilute the polluted water, and the prevailing westerly winds should largely eliminate the fallout menace. Beach-landing flying boats would be invaluable. Their load tonnage would not, of course, match up to that of a convoy of merchant ships but they might be our only means of supply, apart from a few submarines of small load-carrying capacity.

In such conditions, with perhaps half the population wiped out, and with a consequent reduction in the nation's requirements for food, any supplies would be better than none and, if ruthlessly controlled, they could make the difference between continuing the fight and capitulation.

In limited wars or times of national tension the need for large transport aircraft also is great. At the present time we find ourselves with a transport force quite inadequate for the efficient, swift deployment of our army's strategic reserve.

More and more of our overseas bases are slipping from our control, especially in the Indian Ocean. Our landing rights in Pakistan and Ceylon may be permanently denied to us in the near future and even the bases in Malaya and Singapore may come under nationalist anti-British control. We already find ourselves obliged to construct new runways, costing up to two million pounds each, at islands or coral atolls in the Indian Ocean to enable us to keep Imperial "red route" operating.

There is not a land-based aircraft in the Commonwealth which could fly nonstop, with a full payload of troops, from Aden or East Africa to our Far Eastern possessions or to the antipodean Dominions. The *Princesses* could, however, fly nonstop from Aden to Singapore; and from Aden to Australia with only one stop, on the sea off the Cocos Islands, carrying 220 men and their personal arms.

The 220-passenger load of the *Princess* is only a fraction of what is feasible within the next four years. It is possible to foresee a 24-jet engine flying boat, carrying 1,000 fully armed troops, with provision for full-scale feeding and sleeping facilities aboard, thus obviating the need for domestic accommodation ashore at intermediate stops, and being able to lift safely its 1,500,000 pounds all-up weight off the water with six of its engines "out." Such an aircraft would have a freight capacity 10 times that of the *Princess* with a payload over long distances of over 250,000 pounds. Furthermore, it could carry two of our heavy *Conqueror* tanks or six *Centurions* and could discharge its loads across beaches through clamshell nose doors. With a cruising speed of over 400 knots and an ability to alight in midocean in eight-foot sea heights, it would be a veritable flying troopship.

This might seem fantastic. In fact, it is a practicable aircraft that already has been designed by one of our flying boat companies and it relies on straightforward, well-tried engineering techniques. If a firm order were placed now the prototype could be flying in 1960.

With one such aircraft an entire battalion of our strategic reserve could be moved in one lift from the United Kingdom to practically any part of the world in a few hours. Accompanied by a few

freighters of the same type, all their heavy tanks, guns, and motor transport could travel with them. And there would be no need for an airfield at their destination.

Such large aircraft might be considered to constitute an unwarrantable risk with so many lives aboard. This argument has been used in the past whenever large aircraft have been considered. It has seldom carried much weight in the end. In wartime the advantages of so large an aircraft could be expected to outweigh this objection, particularly since the safety factor in flying boats is so remarkably high. To offset their cost they might, with advantage, be made to pay for themselves if they were operated by civil operators, on condition that the fighting services could use them in times of emergency.

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Landing supplies and setting up inflatable pontoons at a mobile base

Fighter Defense

Operating from 25-yard-long PSP ramps with a gradient of one in 10, hydroski equipped *Hunters* or *Javelins* could be located anywhere along our eastern coasts where there was a beach. These aircraft would be limited in their operations on occasion by the wave heights and it is not suggested that our fighter defenses should become entirely pantobased. Nevertheless, it might well be a wise insurance to equip some of our fighters with conversion sets, especially for the interception of low-flying aircraft. The delta configuration of aircraft like the *Javelin* has been found to be particularly suitable for pantobased operation. Supersonic hydroski fighters with fully buoyant fuselages, for which designs have been prepared, also could be built if funds were available.

It would not be the first time that an island's defense relied upon dispersed water-based aircraft. In the Netherlands East Indies during the last war the air force developed this form of defense with seaplanes to a high degree. They mastered the rendezvous problem after takeoff, without the use of ground controlled interception or radar, and seldom were they spotted by the enemy on their numerous lakes and creeks. The Dutch seaplanes were not very effective against Japanese Navy *Zeros*, but they at least avoided the fate of our *Hurricanes* and *Buffalos* which so often were destroyed while refuelling on their airfields.

If we were to develop this idea we might find, in a nuclear war, that our pantobased fighters, operating from easily camouflaged slipways in two's and four's,

were our only means of effective fighter defense. If the approach of fallout were reported, they could be diverted to similar sites constructed in inlets and creeks along the western coasts of Scotland, Northern Ireland, and Wales.

These sites certainly could be attacked by the enemy, but their wide dispersal, limited number of aircraft, and the ease with which they could be camouflaged should make them far less profitable targets for nuclear attack than concrete airfields. This dispersal of our defenses, while posing certain problems of maintenance, briefing, and control, would be an adaptation of the time-honored defense from the perimeter developed by our early forefathers against successive invasions. Already the civil defense authorities are working along the same lines in the event of attacks on cities.

The Deterrent

It would be perfectly feasible to issue hydroski conversion kits to some of our *V*-bombers. Since our defense depends so largely upon our ability to wield the nuclear deterrent, how much better it would be if we could doubly ensure our ability to hit back by making at least some of our *Vulcans* and *Victors* pantobased. Similar length slipways to those required for fighters would suffice, but they would need to be made of concrete.

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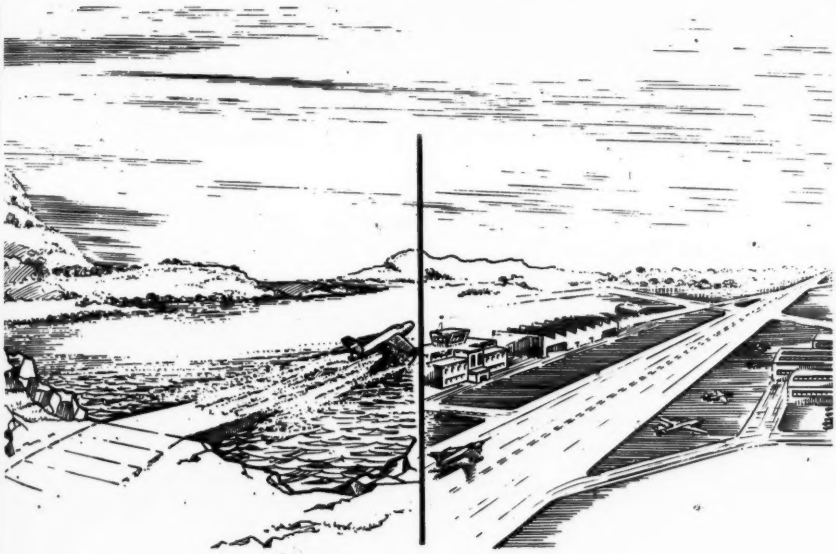
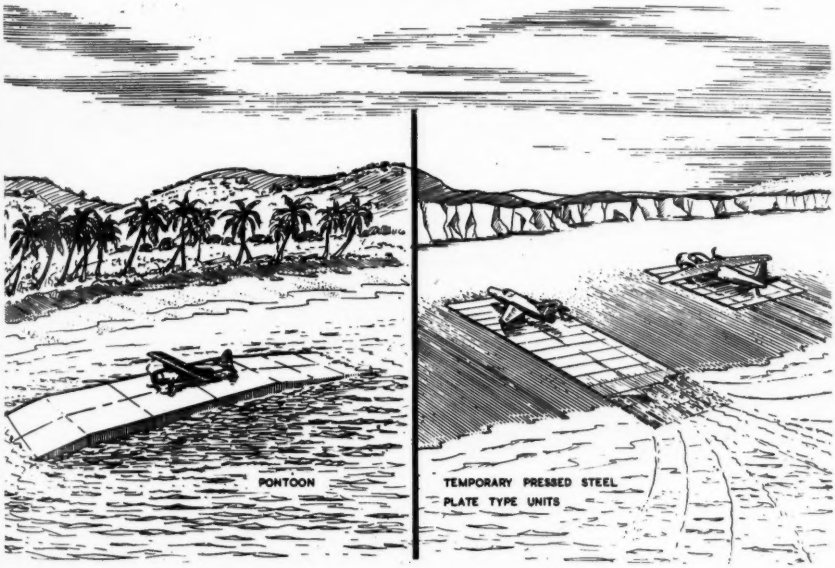
Mobile base of inflatable pontoons can be set up quickly

Nuclear Propulsion

These suggested roles for pantobased or water-based aircraft are for the fore-



A 25-yard concrete or pressed steel plate ramp or beach is all that is required for the beginning or end of a sortie



seeable future—say, until 1962. But there can be no doubt that we will soon have to face up to nuclear-powered aircraft. It has been estimated that the minimum all-up weight of an atomic-powered aircraft cannot be less than 500,000 pounds, largely due to the heavy concrete or lead screening around its radioactive material. Unlike conventionally powered aircraft, there will be an almost negligible "fuel" consumption. Long takeoff runs and high wing loadings on landing would, therefore, be inevitable. No modern runway could take this load and the problems of tires, brakes, and undercarriage construction would be so vast that the flying boat would seem to be the only answer.

Britain has led the world in the past with jet propulsion. She now leads with atomic power. It would be a shame if we were to fail to grasp the opportunity to lead with atomic propulsion merely because we had allowed our national "know how" in the operation of large flying boats to be dissipated on the grounds of economic stringency.

Operational Cost

It often has been claimed that the economic operation of flying boats compares unfavorably with landplanes, although several successful companies throughout the world have proved that flying boats and amphibians can be very profitable.

Recent developments have shown, however, that future designs compare more than favorably with land-based aircraft in initial outlay and running costs. The larger the aircraft the more favorable the economic picture becomes in favor of flying boats, whether military or civil. The large flying boat also gains over its predecessors in this respect in that it is largely independent of fixed bases and can operate for long periods without having to be hauled ashore for maintenance. Furthermore, the great increase it affords to strategic mobility has a direct saving in economic costs.

A comparison between the amortized costs of one light fleet carrier, manned by more than 1,000 men, conveying part of our Parachute Brigade Group to the Middle East in an eight-day voyage and the same operation carried out in eight hours by three 1,000-seat flying boats would show that the former method is extremely uneconomical.

Quite apart from flying boat economies the conversion of some of our fighters

One version of the US *C-123* assault transport uses *pantobase* landing gear

and bombers, together with the construction of short ramps or slipways in sheltered waters around our coasts and the erection of temporary hutted or tented accommodation for their supplies and personnel, would undoubtedly be comparatively cheap in relation to the enormous expense of constructing or even lengthening the runways of operational airfields.

In a country where the purse strings are drawn tight we cannot have everything, and one of the reasons why we have not been able to afford a large water-based force since the war is that we have had to place first things first and, until now, waterborne aircraft have had a low priority. With the advent of these new developments it might be wise to review the priorities. In the last resort it

could be that pantobased or water-based airpower will be the only airpower available to us when the H-bombs start to fall.

The Sea Is the Key

Neither in peace nor in war, be it cold, limited, or global, can we afford to ignore the tremendous advantages, both military and commercial, that would accrue to our services and country from the imaginative employment of water-based aircraft. They can provide us with airpower more flexible than anything we have hitherto enjoyed. Moreover, they can assure for British commercial aviation a bright and prosperous future.

These new flying boat projects undoubtedly would take a large slice of the air budget. The costs could, however, be offset to a large extent by savings in airfield construction at home and abroad, by reduction in the numbers of aircraft carriers, transport ships, and landing craft, and the huge complement of skilled crews required to operate them, and by using these aircraft for civil charter operation in times of peace. They would ensure that our maritime aircraft industry is kept ready for the time when nuclear power can bring about a revolution in air transport, as it is already beginning to do in surface propulsion.

Throughout our island history we have exhibited a native flair for exploiting our maritime resources. Although our natural element down through the ages has been the sea, our defenses during the last 40 years have become increasingly bound up with the air. Aerodynamic and hydrodynamic research have now made it possible for us to harness both elements in conjunction and, should we wish it, to base many types of military aircraft upon the sea itself, in addition to the vastly more expensive and highly vulnerable runways and aircraft carriers upon which we have hitherto so largely depended. In this fashion, should our homeland be devastated from the air, we could still deliver decisive counterblows from the sea.

If we have the foresight to grasp the potentialities of ocean-going flying ships and pantobased airplanes we can assure ourselves of a second string to our bow should our conventional bases be neutralized. Instead of becoming an expendable advanced base, the British Isles thus could be a decisive factor in the fight for air supremacy in a nuclear war.

The Army and Civil Defense

Digested by the MILITARY REVIEW from a copyrighted article* by General Sir Robert Mansergh in "The British Army Review" March 1957.

THERE are two things we all must recognize. The first is that the megaton weapon is not just a bigger bomb than before, but that it can be the cause of a manmade catastrophe of dimensions so vast that it is almost impossible for our imaginations to comprehend. It presents us with an entirely new problem which is nothing less than that of survival, not only as individuals, but as a nation.

The second is that there are people who think that the battle for survival will be a matter exclusively for the Civil Defense Corps, the police, and fire services, assisted possibly by the armed forces. Such an idea is false and dangerous. We must realize that we have no chance of survival unless all the nation's resources of men, women, and material

are organized to play their full part. No one can stand aside.

We in the army, who have so much to offer, shall be failing in our duty if we do not take every opportunity to prepare ourselves to meet the task if war should come. The volunteers who, in peacetime, have given their spare time either in the armed forces or in civil organizations will be in the best position to help themselves and the nation, but every able-bodied person left alive will have to play his or her part.

The [British] Statement on Defense of 1956 specifically places on the armed forces the responsibility of supporting the civil authorities by all possible means in this struggle for survival. How are we to do this?

We must first be clear in what we mean by civil authorities, for there is a danger that our plans will be unrealistic if we underrate the civil effort. This will comprise all the resources of the United Kingdom; not only the central and local authorities, the Civil Defense Corps, the police forces, the National Fire Service, the public utility undertakings, and voluntary bodies, but also industry and the total individual efforts of every member of the population. In short, the civil authorities have resources of men and materials that the army cannot begin to match. With that understanding of the civil effort and of our responsibility to support the civil authorities, let us now look at some of the tasks with which we in the army are likely to be confronted.

Military Assistance

I am certain that the army can help the civil authorities most effectively as an army, not as a new type of civil defense formation. As unskilled labor or as providers of material our contribution is small. It is only by using our military characteristics and skills to the fullest that we can make the maximum contribution to the common cause. These are:

First, the army chain of command which extends throughout the country gives us something of inestimable value. It will enable us not only to maintain control but to adapt our support to deal with unforeseen changes of circumstances. Military operations rarely go according to plan—it is the swift reaction of all commanders and staffs to the unexpected that enables operations to continue to their appointed end and to achieve their object without rigid control from the top. This is largely a matter of experience and training—and in the services there is a wealth of experience second to none.

Second, I am convinced that service training and experience produce in quantity that type of leader who, in times of stress, will be vital at all levels if the country is to survive. I do not, of course, wish to infer that the services have a monopoly of good leaders, but our experience in war and our training in peace do produce commanders at all levels who can work under conditions of great strain.

Third, the army is equipped and organized to be independent of its surroundings. Units can go to the aid of the civil authorities without becoming a burden on their resources. Even when units have exhausted their own resources they can be supplied from civil stocks as units and not as collections of individuals. Ultimately, of course, the army depends on civil resources for everything it needs, and the size of the stocks we can hold is limited. However, we still have the advantage of the ability to organize supply in the field and that ability will be invaluable, whatever the source from which these supplies are drawn.

Many arms and services are by their very nature particularly suited to operate in support of the civil authorities. For example, the Royal Engineers, the Royal Signals, and the administrative services can fulfill vital tasks in their normal role.

I have no doubt that we can make our best contribution only by using these military characteristics to the full. Furthermore, in many instances these are complementary to the weaknesses of the civil organization we are to support. In the chart are set out in some detail the ways in which the army can make the military capabilities and what we can and cannot do. It follows, therefore, that the civil and military chains of command must match as closely as possible, and that at each level cooperation must be as perfect as planning and practice in peace can make it.

I believe that we must aim at a degree best use of these inherent characteristics in support of the civil authorities.

ARMY SUPPORT OF CIVIL AUTHORITIES

1. *In Peace*

Assistance to local authorities in the preparation of plans and cooperation in training.

2. *In War*

a. Provide a steadying influence on the population.

b. Aid to the police—reconnaissance, traffic control, cordoning, and law and order.

c. Aid to the National Fire Service.

d. Care, control, feeding, and accommodation of homeless, and dispersal of homeless to reception areas.

e. Screening, treatment, and evacuation of casualties.

f. Organization of mass evacuation.

g. Provision of guards on vital stocks.

h. Distribution of essential supplies.

i. Maintenance of signal and other communications.

j. Provision and control of transport, including civil transport.

k. Provision of working parties.

l. Organization of skilled and unskilled labor units from civilian refugees.

m. Restoration and maintenance of road, rail, and water communications.

n. Rescue work.

o. Reconnaissance and liaison (especially air observation posts).

p. Provision and operation of camps for all purposes.

3. In addition, commanders and staffs, including advisors and heads of services at all levels, will have the responsibility of doing all they can to assist and advise the civil authorities in peace in the preparation of plans and in the preparation of appropriate training exercises, and in war in the execution of operations and in the collection and dissemination of intelligence.

Effective Support

If we are to give the civil authorities really efficient support, we not only must know when and where help is needed and what the tasks are, but the civil authorities must have a wide knowledge of our of cooperation between the army and the civil authorities that is far closer than has ever been achieved between the three armed services in the past. We must aim at that state of affairs where any commander or staff officer on the civil side knows instinctively when the experience and training of the soldier will be of assistance to him, and similarly we as

soldiers must know where the advice of the civilian can profitably be sought.

It is perhaps worth remembering that the cooperation achieved between the three armed services developed to its present high level only during the last war. We must now ensure that the knowledge and experience of working with the other services which we learned in that war is extended to cover cooperation with the civil authorities at all levels. It became an accepted fact that commanders and staffs of joint headquarters not only worked together but lived together, and the confidence gained by knowing one's opposite number in another service was invaluable. If this were necessary among service officers with similar backgrounds, how much more will it be necessary now that joint planning and training with the civil authorities have started.

If we are to develop the necessary high degree of joint planning in peace and command in war, much practice is essential. We also must aim to achieve a far higher standard of joint command technique than exists at present. In fact, we must learn to understand each other's language and eventually work out and use a common language to deal with our common problems. At present we lack many of the aids which are so essential to efficient cooperation and are covered by the term "staff duties."

At present another stumbling block is our mutual ignorance of each other's organization. The armed services must learn a great deal about the organization of the civil defense forces and the system of local government in this country. The civilians equally could learn much more about our military organization, methods, and capabilities.

Apart from limited training in light rescue and an increased attention to first aid, except for commanders and staffs, I do not believe that this new task calls for special training on the part of units.

Formations and units must, of course, train to live, move, and work under thermonuclear conditions.

Conclusion

If this country is ever attacked with thermonuclear weapons there will follow a struggle for survival of the grimmest kind. It will need our entire national resources of manpower and materials to survive the initial shock and ensure that civilization, as we know it, continues to exist in these islands. Whether we like it or not, we shall all be in it, either as part of a formed and disciplined body, or else as so much unskilled manpower pressed into service at the last moment by the nearest authority.

The army has a vital role to play, and I cannot do better than quote from the Government's Statement on Defense of 1956:

All armed forces, whether regular or reserve, in the country at the outbreak of war will have to be prepared to assist in the struggle for survival. The armed forces are in no sense a substitute for civil administration; the aim will be to support the civil authorities by all possible means.

If we are to meet these increased responsibilities, I consider it essential that all commanders and staffs know the nature of the problem, and that they and the civil authorities understand how best we can help in planning and executing joint operations. The closest liaison at all levels with civil authorities is clearly becoming increasingly important.

Every unit must first become and remain an efficient military unit; once that is achieved, the additional skills like rescue and first aid can be learned to good purpose.

To support the civil authorities we must operate as an army, and the better soldiers we all are, the better we can help.

Initiative

Digested by the MILITARY REVIEW from an article by Major General Nawabzada Mohammad Sher Ali Khan in "Military Digest" (Pakistan) August 1955.

IT IS said that initiative is the basis of efficiency and is essential for the successful completion of any task. What is initiative? Basically, it is the aptitude and ability to act independently with self-reliance and enterprise.

There are many people who possess a number of other qualities such as courage, loyalty, and discipline, but lack self-confidence and the ability to work independently. They look to their superiors for guidance even in minor things and are apt to find themselves completely helpless in the absence of this guidance. Their condition is similar to a traveler who is surrounded by darkness, waits for lightning to take a few steps, and then stands still. It was such men that the famous Urdu poet, Insha, had in mind when he satirically said: "It is the worst of times; wherever one goes people complain that they have nothing to do."

Initiative, therefore, is the ability to continue with a task even when, for some reason, the guidance is not at hand. It is this quality that singles out the leaders. Without it life is but an empty routine; but given initiative, there is no difficulty which can defy solution for long.

Importance

The importance of initiative and its necessity in the day-to-day life of a nation cannot be overemphasized. An independent and self-respecting nation has to think, plan, and act independently and cannot afford to look to others for guidance. Every country has to go through trying circumstances and face crucial times, and it is only with initiative that the nation can withstand trial and crisis.

In his daily life a normal citizen has to contribute quite a lot toward the progress of his country. As an individual he is an important unit which collectively forms a nation. In his social and civic life he cannot afford to leave most of the things to be done by the government or any semi-government organization. He has to play his part independently and confidently. This can only be possible if he develops the quality of initiative. Fortunately it is a quality that can be developed.

To a soldier, too, initiative is an attribute of vital importance, for it can turn a defeat into victory. Yet how often one comes across a driver who drops out of a convoy and then stands helplessly by his vehicle parked in the middle of the road. He literally looks for someone to come out of nowhere to help him. It might be the simplest of defects in the engine but he dare not take the initiative to look under the hood. His mates, riding in the vehicle, often are equally unimaginative. Not only do they not move the vehicle to one side, they do not even bother to find out why it stopped.

A New Nation

The malady of a nation lacking initiative is, to some extent, similar to the one that befell the children of Israel when Moses emancipated them from the thralldom of Pharaoh and led them to Palestine. Centuries of slavery had suppressed their initiative to such an extent that they were absolutely incapable of independent thought or action. They did not know what to do with their freedom. In utter bewilderment they longed to go back to the old life of toil and misery, which made no calls upon their faculty of thinking. They just wanted to escape the novel "horror" that freedom had brought them, namely the need to think and decide for themselves.

Even the celestial food which was theirs

without labor had no charm, for this too required a measure of initiative on their part. They proved singularly bad soldiers. When faced with the enemy they entreated Moses to call upon God to fight their battle for them.

The object in relating this story is to bring out the fact that inertia in the wake of freedom is a historical truth and is, by no means, peculiar to any particular nation. This inertia is usually a passing phase. A nation that is subjected to foreign domination gets little or no chance to attend to matters of statecraft and administration independently. This naturally results in the development of a false sense of security and dependence upon others in every sphere of life. For such people, anything coming from others is the gospel truth and an article of faith. They learn to do a job, but can seldom appreciate its significance. They are like the radio operator who receives a coded message but does not know what it means if he does not have the key to the cypher.

Man is by nature inquisitive and this gives him an incentive for the exercise of his initiative. There are circumstances when this quality is deliberately suppressed but he regains it gradually when he is given the freedom of action again. Therefore, we should not feel pessimistic when we see people showing lack of initiative. However, it would be wrong to let things take their own course, for lack of initiative creates a vacuum which invites aggression that can result in the loss of freedom.

In a country which is under foreign rule, the armed forces are an instrument for the defense of that country only insofar as they serve the interests of the parent nation. The employment of these forces, their organization, equipment, and tactical doctrine, as well as the professional education of "local" officers, is fashioned accordingly.

This undermines the foundations of all forms of initiative and creative thinking, which is done for them by others. Thus when a country regains its freedom these shortcomings come to the fore. On short notice men have to be found who, in spite of the limited and warped nature of their apprenticeship, have preserved the capacity to face new responsibilities, have the originality and initiative to think for themselves, and have the imagination and ability to formulate policy. Such men are few and far between. But they must be found, and they must be encouraged and given the opportunity to reeducate the younger generation by their example and guidance.

The Armed Forces

Men in the armed forces must not be driven like cattle without consciousness of purpose. Their training should be such that they can complete the designated task without supervision. If they are required to reach a certain point it should be sufficient to tell them to go there and not to be marched under a noncommissioned officer. They must be given an opportunity to use their initiative, to do the right thing themselves instead of always being spoon-fed, for spoon-feeding is perhaps the most habit-forming thing in the world. The sooner it is dropped the better. Unending directions from superiors destroy a man's initiative and render him incapable of independent action. In modern warfare initiative is as essential as physical fitness.

At no period in the history of war has this attribute assumed greater importance than today. With the advent of the nuclear weapon and its immense powers of destruction, a new pattern of dispersion has been imposed on warfare. We still have to concentrate for an action but we must do so rapidly and for the minimum period of time. This demands speed and flexibility not only in regard to tactics, organizations, and equipment, but also in

the mental attitude of those who are destined to employ them. Units will be forced to operate and exist in greater isolation than ever before; orders will be less and less binding and a much greater margin of initiative will have to be left to comparatively junior commanders. We can only assimilate, prepare for, and eventually conduct this new form of warfare if our peacetime training has educated our minds to take the mental strain it imposes, and if it has succeeded in inculcating in us the attributes which it demands. Of these, initiative in thought as well as action occupies a place of the greatest importance.

Conclusion

However, a note of warning is necessary at this stage. Inculcation of initiative in men must be progressive and carefully planned. Unless closely watched initiative may easily degenerate into indiscipline. Indeed, initiative and discipline go hand in hand. Initiative in the undisciplined invariably results in chaos.

Every healthy man possesses a certain amount of creative power; all he needs is a congenial atmosphere for development. Conditions should, therefore, be created wherein men may have full opportunity to use their initiative. Intentional killing of initiative is criminal. If a soldier puts forward a useful suggestion he should not be snubbed or discouraged by his superior merely for the sake of pleasing his own vanity.

To become a really strong army it is most essential to develop the quality of initiative. After all how far can one go in these days of darkness with the aid of light borrowed from others?

There is one element in the mighty arsenal of our military strength which takes precedence above all others as the chief guarantor of our security. I refer to the devoted men and women who wear the American uniform. They constitute the foundation of our defensive power. Of what value are the best weapons that science can devise unless they are in the hands of trained and courageous fighters, imbued with high morale and an indomitable spirit? After all is said and done, man is the 'ultimate weapon.'

Secretary of the Army Wilber M. Brucker

BOOKS OF INTEREST TO THE MILITARY READER

LIFELINE IN THE SKY. The Story of the U. S. Military Air Transport Service. By Clayton Knight. 264 Pages. William Morrow & Co., Inc., New York. $6.00.

BY COL RONALD R. WALKER, *USAF*

This factual history, travelogue, and statistical treatise could be used as a textbook at military schools on operations of the Military Air Transport Service. It is timely, easy to read, and skillfully illustrated.

It is more than the development and function of the world's largest intercontinental cargo and personnel airline, made necessary by World War II, Korea, and the cold war. It reminds military people not only of their air journey overseas on MATS but that the receipt of urgent supplies, the GCA landing required, the film viewed, the map being used, or the message transmitted around the world all are results of a MATS function. As the author summarizes:

Technical training of the younger generation, the saving of hundreds of civilian lives, improvement in communications, and the advantages civilians get from weather reporting—all these benefits are willy-nilly byproducts of a great military airline.

The description of "Flying the Hump," the pioneering of air facilities in troubled spots, and operations in areas of diplomatic sensitivity in peacetime, all leave the reader with no doubt of the continuing requirement for the mission of MATS.

DE CLAUSEWITZ A LA GUERRE FROIDE (From Clausewitz to the Cold War). By Colonel Louis Berteil. 410 Pages. Berger-Levrault, Paris, France. $3.00.

BY LT COL JEAN P. MESLET, *French Army*

This French-language volume presents a study of modern strategy and tactics from a very general standpoint. The author considers that the tendency of our time is to crystallize our military thinking on a single enemy and a single theater of operations rather than weigh the general aspects of war as created by political and technical developments.

The first part of the book deals with the principles and trends. Old and new military principles are discussed.

The second part stresses: "It is obvious that nowdays any new invention can at any time upset all accepted military data." It also discusses the five main factors of a valid military system: morale, organization, equipment, employment, and maintenance.

The third section deals with the applicatory aspects of military power and current concepts such as psychological warfare and guerrilla type warfare.

With 16 sketches and maps the book is a comprehensive, interesting, and lucid contribution to military art. The author says:

If some gloomy individuals feel that this work looks like a cookbook it is perhaps because strategy shares with cooking the advantage of being both an art and a science.

A PSYCHOLOGICAL WARFARE CASEBOOK. By William E. Daugherty, Operations Research Office, in collaboration with Dr. Morris Janowitz, University of Michigan. 880 Pages. The Johns Hopkins Press, Homewood, Baltimore, Md. $12.50.

BY LT COL RODGER R. BANKSON, *Inf*

This volume which includes one or more selections by 73 authors is not for the casual reader, although it is most interesting. As a casebook it is a good one—a valuable reference for the serious student in an exceedingly important field. It is well-organized and discussions and summaries are illustrated with interesting examples.

Because psychological warfare is part of a nation's effort in directing its moral and physical strength against or even in support of other nations, there are a number of agencies which inescapably will contribute to the end product, deliberately or involuntarily. In pointing up this problem the book adequately illustrates the lack of coordination which on occassion has contributed to less than effective psychological warfare. Also covered are organization and personnel; objectives; planning; media, methods, and techniques; and the problems of evaluation. The final chapter, "Soviet Psychological Warfare," is interesting and informative.

This is the last of a series of manuals, the other two being *The Nature of Psychological Warfare* and *Target Analysis and Media in Propaganda to Audiences Abroad.* With three volumes in the series, comments made after reading only one may not be fair. This volume, however, appears to have at least one shortcoming. It is probable that in no other period of war and tension has psychological warfare received so much relative emphasis as it did in Korea and also in the Far East during 1950-55.

However, not considered are such psywar arenas as Panmunjom and Koje-do. The Communist germ warfare campaign of charges and "confessions" also is ignored. While these areas of psywar activity may have been unique in their time, it must be anticipated that they can recur in the continuing struggle between West and East.

Some Eighth US Army field operations in Korea are used as illustrations, but there is a void above that level. Missing from the list of authors are those who ordered, devised, and directed the Far East Command/United Nations Command psychological warfare effort through the war, truce negotiations, and the uneasy armistice in Korea. And one wonders, for instance, why the colorful but colored account of a free-lance civilian author is selected in the case of the $100,000 offer for a *MiG* aircraft when a more accurate description and evaluation should be available. The imaginative and amazingly effective "*MiG* offer" deserves more than superficial treatment, as do several other psywar problems and operations which are unclassified or should be unclassified by now.

THE TANK COMMANDER'S GUIDE. By The United States Army Armor Human Research Unit, Fort Knox, Kentucky. 425 Pages. The Military Service Publishing Co., Harrisburg, Pa. $2.95.

BY LT COL GEORGE B. MACAULAY, *Arty*

Two years ago USCONARC told the authoring group to analyze the activities and duties of the tank commander. The Fort Knox group, under the technical supervision of the Human Resources Research Office of The George Washington University, interviewed many tank commanders in the field and studied all available literature on the subject. The findings provided the material for this unique paperbound book which will be of great value to armor unit commanders as well as tank commanders.

FIRST BLOOD. The Story of Fort Sumter. By W. A. Swanberg. 373 Pages. Charles Scribner's Sons, New York. $5.95.

BY MAJ L. GORDON HILL, JR., *Arty*

W. A. (Sickles the Incredible) Swanberg has done it again—this time with the Fort Sumter story. The book revolves around Major Robert Anderson who assumed command of the Charleston forts in late November 1860. A one-time slaveholder himself, Anderson went through four of the most frustrating months imaginable. His frustrations arose not from carrying out orders but from trying to find out from a divided and confused Washington just what his orders were. The Secretary of State had dispatched an Army-Navy task force to reinforce Fort Sumter without either the approval or knowledge of the Secretaries of War and Navy.

When Major Anderson arrived in Charleston he realized that the only manned fort, Fort Moultrie, stood no chance against an attack. The sole hope for the Federal garrison lay in occupying and defending Fort Sumter. By some strange reasoning, wild-eyed partisans of both the North and the South had twisted the fate of the Nation until it seemed to hang on whether Anderson and his 70-odd men could accomplish this.

Anderson pulled off a brilliant evacuation to Fort Sumter, basing his action on military necessity and a commonsense interpretation of vague generalities he had received as orders.

Previous writings on Robert Anderson generally have pictured him as a warmonger and a hothead who ignored orders. Swanberg sets the record straight by picturing him as a fighter for peace, a Southerner whose first regard was duty, and as a professional soldier who suffered mightily under the inept civilian leadership then in the Government.

This book is the ideal beginning for the many readers who will become avid students of the Civil War during the war's approaching centennial.

OUR NUCLEAR FUTURE. By Edward Teller and Albert L. Latter. 184 Pages. Criterion Books, New York. $3.50.

BY LT COL GEORGE D. CARNAHAN, *OrdC*

What will be the consequences of the use of nuclear energy in peace and in the cold war? What are the dangers and the opportunities for the individual, the nation, and the human race? To answer these questions two nuclear physicists have written this concise and authoritative account of what is known about the basic nuclear processes. The effects of radioactivity and fallout from nuclear weapons are explained clearly and simply.

Fusion as well as fission reactions are covered in detail. A commonsense approach is taken on the discussion of radiation from fallout.

As concerns thermonuclear weapons, the authors believe that all reasons—respect for human life, military considerations, and simple sanity—lead to one conclusion: In the development of nuclear weapons *we must endeavor to make them clean.*

The authors note that if an invader adopts extreme dispersion, it will become impossible to defeat him with atomic weapons, but a very highly dispersed army can be defeated by a determined local population. Therefore, the main role of nuclear weapons might well be to disperse any striking force so that the resistance of people defending their homes can become decisive.

This book permits the reader to make intelligent judgments about a problem that may affect the life, health, safety, and progress of all of us. It is a book of importance to everyone concerned with one of the major problems of our time.

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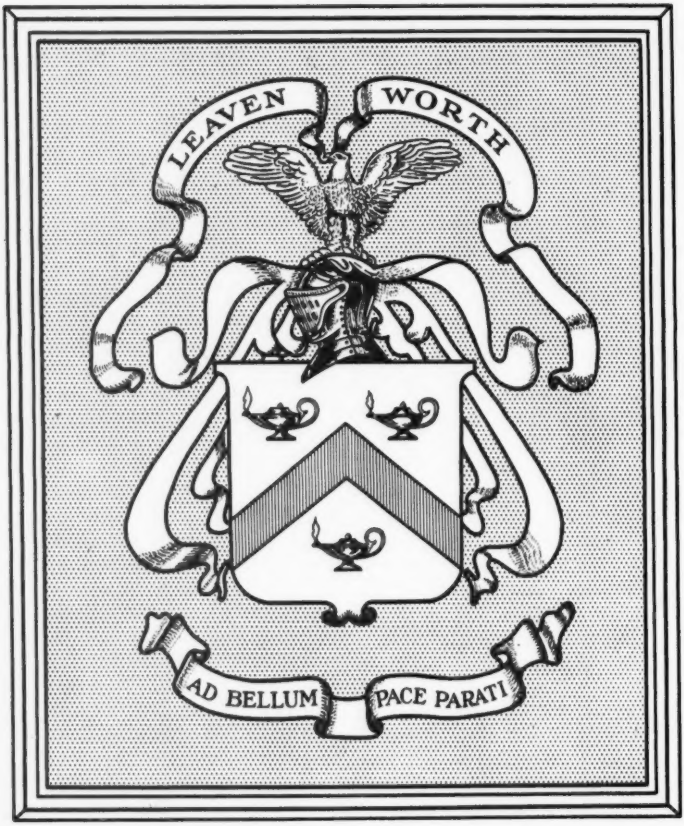

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